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# Agricultural Experiment Station

College of Agriculture, West Virginia University

HENRY G. KNIGHT, Director

Morgantown

## INFLUENCE OF RATIONS FED TO GROWING CHICKENS ON THE CHARACTERISTICS OF THE ADULT FEMALES

(TECHNICAL)



Brooder House in Which Chicks Were Raised. On the Left is Shown the Poorly-Fed Lot and On the Right the Well-Fed Lot.

BY

HORACE ATWOOD

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## THE INFLUENCE OF RATIONS FED TO GROWING CHICKENS ON THE CHARACTERISTICS OF THE ADULT FEMALES

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When chickens are raised by artificial means, the conditions surrounding their early growth and development are frequently far from ideal. During the period of incubation the temperature may become too high or too low, or possibly not enough fresh air may be supplied during the latter part of the hatch at which time the need is greatest. After the chicks are placed in the brooder, their anatomically poorly-protected lungs may not be kept warm enough at night and many of the chicks may be injured or may die through inflammation of the lungs. The feed which they receive during the growing period may be too scanty in amount or its composition may be unsuited to their requirements.

To what extent, if at all, do any or all of these or other related factors affect the future productivity of the females? This question opens a vast field for experimental inquiry, for if it should be shown that a certain method of handling the growing stock affects favorably or unfavorably the fecundity of the females or the vigor of their progeny, then it would be necessary through repeated trials to determine the best method for handling the growing chickens so that their future fecundity would be at a maximum and their offspring most vigorous.

The influence of early environment, including the food supply, upon the later fecundity of the females and the vigor of their offspring, is a fundamental problem of the poultry industry because it is possible that improved breeding and better methods of feeding and handling the mature stock may not bring about the greatest possible benefits unless accompanied by proper methods of raising the chicks.

The solution of the problem of the influence of rations is complicated by the forces of heredity which may cause one female to

be an extra good layer and another to be a poor layer. In this experiment the production of sisters only is compared.

The work described in this publication has been carried on for the purpose of determining whether the ration fed to growing chicks influences (1) either the number or the weight of the eggs laid by the females after they have arrived at sexual maturity, (2) the effect of the ration on the mature live weight of the females, or (3) the effect upon the age of arriving at sexual maturity.

### **General Plan of Experiment**

The general plan of the experiment was as follows. Pedigreed chickens hatched in the same incubator were divided into two lots similar in respect to parentage. Both lots were fed the same basic grain ration. In addition to this ration, one lot received a liberal supply of skim milk, while the other lot was fed but little milk. The cockerels were removed at broiler age, and somewhat later all pullets were removed except where there were sisters in each lot. As soon as the first egg was laid the two lots of sisters which had been fed the two contrasted rations were placed together in one flock, and a trap-nest record was kept of their egg production and the weight of the eggs laid. When the chickens were small, each lot was weighed weekly. Later, after the pullets began to lay, each pullet was weighed monthly.

The experiment was started July 24, 1920, and in this publication data are presented covering the two laying seasons of 1921 and 1922. In 1921, chicks were hatched from eggs laid by the fowls then in the experiment and data covering these birds are presented for the laying season of 1922.

### **Hatching the Eggs**

Table 1 gives the band numbers of the sires and the dams and certain details of the hatch from which the chicks used in the first experiment were obtained.



TABLE I.—Record of Hatch of Chicks Used to Start the Experiment

| Sire's<br>Number | Dam's<br>Number | Number of<br>Eggs<br>Incubated | Number of<br>Eggs<br>Infertile | Number of<br>Chicks<br>Hatched |
|------------------|-----------------|--------------------------------|--------------------------------|--------------------------------|
| 192              | 94              | 8                              |                                | 8                              |
| 192              | 101             | 6                              | 1                              | 4                              |
| 192              | 104             | 8                              |                                | 4                              |
| 192              | 107             | 8                              |                                | 8                              |
| 192              | 109             | 6                              |                                | 5                              |
| 193              | 12              | 9                              |                                | 9                              |
| 193              | 14              | 9                              | 2                              | 5                              |
| 193              | 15              | 5                              |                                | 3                              |
| 193              | 18              | 8                              | 1                              | 4                              |
| 193              | 22              | 8                              |                                | 7                              |
| 194              | 7               | 8                              |                                | 2                              |
| 194              | 10              | 10                             |                                | 10                             |
| 194              | 30              | 7                              |                                | 7                              |
| 194              | 34              | 8                              |                                | 6                              |
| 194              | 35              | 7                              | 4                              | 2                              |
| 194              | 37              | 8                              | 5                              | 3                              |
| 194              | 39              | 7                              | 1                              | 5                              |
| 194              | 45              | 8                              |                                | 6                              |
| 194              | 46              | 9                              | 1                              | 8                              |
| 194              | 47              | 9                              | 6                              | 3                              |
| 194              | Y9731           | 7                              | 3                              | 4                              |
| 195              | 49              | 7                              |                                | 6                              |
| 195              | 55              | 7                              |                                | 7                              |
| 195              | 65              | 9                              | 2                              | 6                              |
| 195              | 66              | 7                              |                                | 7                              |
| 195              | 73              | 5                              |                                | 2                              |
| 195              | Y9779           | 6                              |                                | 5                              |
| 196              | 2               | 6                              | 4                              | 2                              |
| 196              | 19              | 8                              |                                | 8                              |
| 197              | 82              | 6                              |                                | 5                              |
| 197              | 84              | 10                             |                                | 6                              |
| 197              | 88              | 8                              |                                | 3                              |
| 197              | 91              | 8                              |                                | 5                              |
| 197              | Y9791           | 6                              |                                | 4                              |
| 198              | 134             | 9                              | 3                              | 4                              |
| 198              | 137             | 9                              |                                | 9                              |
| 198              | 138             | 8                              | 1                              | 5                              |
| 198              | Y9873           | 7                              |                                | 7                              |
| 199              | 103             | 8                              |                                | 7                              |
| 199              | 123             | 8                              | 2                              | 0                              |
| 199              | 126             | 7                              |                                | 5                              |
| 199              | 130             | 9                              |                                | 2                              |
| 199              | 135             | 5                              |                                | 5                              |
| 199              | Y9729           | 5                              |                                | 2                              |
| 200              | 3               | 6                              |                                | 6                              |
| 200              | 16              | 10                             |                                | 8                              |
| 200              | 28              | 7                              |                                | 7                              |

Cyphers incubator was used and was started July 24, 1920.

When the chickens were removed from the cheese-cloth sacks in which the eggs from each hen had been placed just before they began to pip, they were leg banded and alternately placed in two lots

designated as Lot A and Lot B. Two similar Newtown brooders located in adjoining rooms in the same building were used for brooding the chickens, and the out-door runs were reduced to 400 square feet for each flock so as to eliminate the possibility of the chickens' obtaining a sufficient quantity of insects and worms to influence the results.

### **Feeding the Chicks**

During the first week both lots of chickens were fed a similar ration, and the feeding experiment began when they were one week old.

Tables II and III which follow show the amount of feed consumed each week, the number of pounds of grain consumed per week per hundred chicks, and the weight of the chickens each week calculated per one hundred chickens.



TABLE II.—Amount of Feed Consumed Each Week Until Pullets Began to Lay

| Week<br>of<br>Test | Scratch<br>Feed<br>Lbs. |      | Corn<br>Meal<br>Lbs. |      | Wheat<br>Bran<br>Lbs. |      | Wheat<br>Middlings<br>Lbs. |      | Corn<br>Lbs. |      | Wheat<br>Lbs. |      | Oats<br>Lbs. |     | Condensed<br>Buttermilk<br>Lbs. |   | Meat<br>Scrap<br>Lbs. |     | Skim<br>Milk<br>Pints |      |
|--------------------|-------------------------|------|----------------------|------|-----------------------|------|----------------------------|------|--------------|------|---------------|------|--------------|-----|---------------------------------|---|-----------------------|-----|-----------------------|------|
|                    | A                       | B    | A                    | B    | A                     | B    | A                          | B    | A            | B    | A             | B    | A            | B   | A                               | B | A                     | B   | A                     | B    |
| 1st*               |                         |      |                      |      |                       |      |                            |      |              |      |               |      |              |     |                                 |   |                       |     |                       |      |
| 2nd                | 2.9                     | 3.0  | 9.7                  | 8.7  | 1.0                   | 0.9  | 1.0                        | 0.9  |              |      |               |      |              |     | 5.4                             |   |                       |     | 5.0                   | 3.5  |
| 3rd                | 2.5                     | 2.5  | 11.7                 | 8.8  | 1.3                   | 0.5  |                            |      |              |      |               |      |              |     |                                 |   |                       |     | 18.5                  | 2.5  |
| 4th                | 2.0                     | 1.5  | 20.0                 | 15.4 | 1.5                   | 0.5  |                            |      |              |      |               |      |              |     |                                 |   |                       |     | 33.0                  | 7.5  |
| 5th                | 5.0                     | 3.5  | 13.4                 | 8.1  | 8.0                   | 5.3  |                            |      |              |      |               |      |              |     |                                 |   |                       |     | 39.0                  | 4.5  |
| 6th                | 8.0                     | 5.0  | 13.6                 | 9.0  | 6.8                   | 5.0  |                            |      |              |      |               |      |              |     |                                 |   |                       |     | 28.0                  | 3.0  |
| 7th                | 11.5                    | 6.0  | 20.0                 | 9.6  | 10.0                  | 4.8  |                            |      |              |      |               |      |              |     |                                 |   |                       |     | 39.0                  | 5.0  |
| 8th                | 9.5                     | 6.2  | 28.8                 | 10.2 | 14.4                  | 5.1  |                            |      |              |      |               |      |              |     |                                 |   | 3.5                   |     | 54.0                  | 2.0  |
| 9th                | 10.7                    | 6.2  | 17.0                 | 6.0  | 17.0                  | 6.0  | 17.0                       | 6.0  |              |      |               |      |              |     |                                 |   | 1.7                   |     | 52.0                  | 10.0 |
| 10th               | 22.7                    | 10.2 | 16.0                 | 6.6  | 16.0                  | 6.6  | 16.0                       | 6.6  |              |      |               |      |              |     |                                 |   | 2.7                   |     | 82.0                  | 7.0  |
| 11th               | 22.2                    | 13.5 | 19.0                 | 7.5  | 19.0                  | 7.5  | 19.0                       | 7.5  |              |      |               |      |              |     |                                 |   | 3.5                   |     | 18.0                  | 6.0  |
| 12th               | 22.7                    | 12.7 | 23.5                 | 8.1  | 23.5                  | 8.1  | 23.5                       | 8.1  |              |      |               |      |              |     |                                 |   | 3.2                   |     | 54.0                  | 4.0  |
| 13th               | 27.0                    | 11.0 | 29.6                 | 10.0 | 29.6                  | 10.0 | 29.6                       | 10.0 |              |      |               |      |              |     |                                 |   | 4.7                   |     | 78.0                  | 24.0 |
| 14th               | 36.5                    | 11.0 | 29.0                 | 13.0 | 29.0                  | 13.0 | 29.0                       | 13.0 |              |      |               |      |              |     |                                 |   | 2.7                   | 1.7 | 99.0                  | 21.0 |
| 15th               | 49.7                    | 10.7 | 24.7                 | 16.0 | 24.7                  | 16.0 | 24.7                       | 16.0 |              |      |               |      |              |     |                                 |   | 2.5                   | 2.2 | 36.0                  | 51.0 |
| 16th               | 49.7                    | 17.0 | 27.8                 | 21.3 | 27.8                  | 21.3 | 27.8                       | 21.3 |              |      | 29.2          | 13.7 |              |     |                                 |   | 6.0                   | 3.2 | 30.0                  | 25.0 |
| 17th               | 7.7                     | 10.0 | 6.5                  | 6.0  | 6.5                   | 6.0  | 6.5                        | 6.0  |              |      |               |      |              |     |                                 |   |                       |     |                       |      |
| 18th               |                         |      | 5.0                  | 5.1  | 5.0                   | 5.1  | 5.0                        | 5.1  | 34.0         | 15.0 | 9.0           | 5.0  |              |     |                                 |   |                       |     | 28.0                  | 4.0  |
| 19th               |                         |      | 2.5                  | 4.2  | 2.5                   | 4.2  | 2.5                        | 4.2  | 36.0         | 18.0 | 10.0          | 10.0 |              |     |                                 |   |                       |     |                       |      |
| 20th               |                         |      | 6.1                  | 4.2  | 6.1                   | 4.2  | 6.1                        | 4.2  | 38.5         | 14.5 |               |      |              |     |                                 |   |                       |     |                       |      |
| 21st               |                         |      | 6.4                  | 2.7  | 6.4                   | 2.7  | 6.4                        | 2.7  | 13.5         | 13.5 |               |      | 9.0          | 6.0 |                                 |   |                       |     | 12.0                  | 1.0  |
| 22nd               |                         |      | 1.7                  | 3.9  | 1.7                   | 3.9  | 1.7                        | 3.9  | 20.9         | 12.5 |               |      |              |     |                                 |   |                       |     | 8.0                   | 1.0  |
| 23rd               |                         |      | 1.6                  | 2.6  | 1.6                   | 2.6  | 1.6                        | 2.6  | 23.1         | 21.0 |               |      |              |     |                                 |   |                       |     | 4.5                   | 1.0  |

\*The lots were fed a similar ration.

**TABLE III.—Number and Weight of Chickens and Number of Pounds of Grain and Meat Scrap Consumed Weekly Per Hundred Chickens**

| Week of Test | Number of Chicks at Beginning of Week |     | Weight of Chicks Per 100 at Beginning of Week |       | Pounds of Grain and Meat Scrap Per 100 Chicks Per Week |       |
|--------------|---------------------------------------|-----|---|-------|--|-------|
|              | A                                     | B   | A   | B     | A  | B     |
| 1st          |                                       |     |   |       |  |       |
| 2nd          | 126                                   | 119 | 10.8  | 10.2  | 11.6   | 11.3  |
| 3rd          | 120                                   | 115 | 14.1  | 11.2  | 12.9   | 10.3  |
| 4th          | 120                                   | 113 | 18.1  | 12.3  | 19.6   | 15.4  |
| 5th          | 118                                   | 105 | 24.9  | 14.0  | 22.4   | 16.1  |
| 6th          | 116                                   | 101 | 32.6  | 17.9  | 24.5   | 18.8  |
| 7th          | 112                                   | 95  | 42.7  | 21.1  | 37.0   | 21.5  |
| 8th          | 110                                   | 93  | 55.4  | 24.5  | 51.1   | 23.1  |
| 9th          | 110                                   | 92  | 69.4  | 29.0  | 57.6   | 26.3  |
| 10th         | 110                                   | 90  | 84.4  | 33.2  | 66.7   | 33.3  |
| 11th         | 110                                   | 90  | 108.8   | 39.3  | 75.2   | 40.0  |
| 12th         | 110                                   | 89  | 126.0   | 44.4  | 87.6   | 41.6  |
| 13th         | 110                                   | 88  | 151.4   | 52.6  | 109.5  | 46.6  |
| 14th         | 108                                   | 87  | 174.4   | 60.8  | 116.8  | 59.4  |
| 15th         | 108                                   | 86  | 201.4   | 85.6  | 117.1  | 70.8  |
| 16th         | 108                                   | 85  | 213.4   | 107.1 | 125.5  | 98.9  |
| 17th         | 58*                                   | 45  | 215.8   | 119.5 | 107.6  | 97.1  |
| 18th         | 58                                    | 45  | 221.4   | 132.4 | 105.5  | 82.9  |
| 19th         | 58                                    | 45  | 237.6   | 144.6 | 92.2   | 90.2  |
| 20th         | 58                                    | 45  | 241.0   | 156.5 | 98.0   | 60.2  |
| 21st         | 30**                                  | 29  | 257.7   | 174.5 | 109.0  | 74.5  |
| 22nd         | 30                                    | 29  | 242.0   | 173.1 | 116.7  | 104.1 |
| 23rd         | 30                                    | 29  | 266.6   | 187.3 | 93.0   | 99.3  |

\*Cockerels removed.

\*\*Females removed except sisters in each lot.

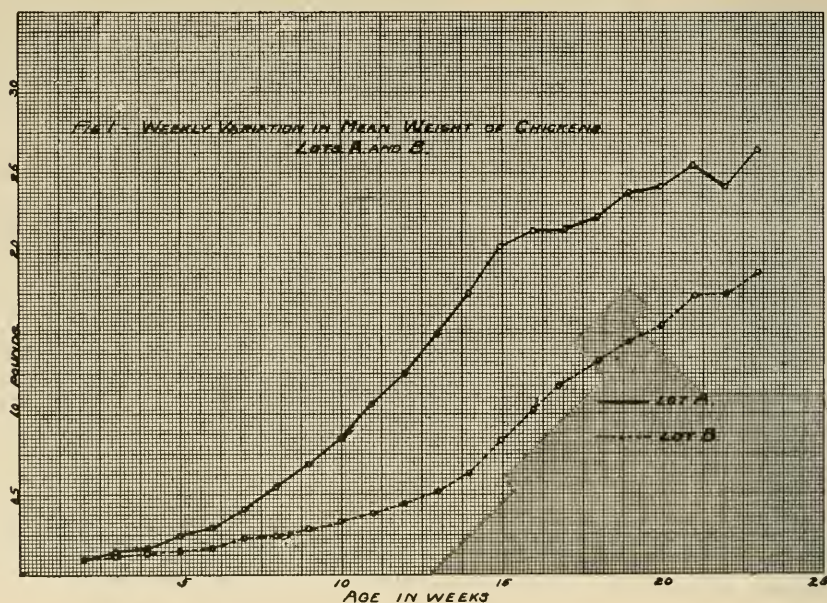


Fig. 1.—Weekly Variation in Mean Weight of Chickens.

**Greater Grain Consumption in Lot A.**—Both lots of chickens were fed liberally in respect to their grain ration, yet Lot A which received the liberal supply of milk consumed more grain than did Lot B. Table III shows that on the seventh week and extending to the fifteenth week Lot A consumed practically twice as much grain per bird per week as was the case with Lot B. At that time on account of the cold weather it seemed necessary to feed Lot B more milk and meat scrap than formerly, so during the last seven or eight weeks the difference in the amount of grain consumed was less marked. Both lots were provided with cabbage or sprouted oats as succulence.

**Rate of Gain in Weight.**—Table III and Fig. 1 show that Lot A grew so much faster than Lot B that on the seventh week the chickens fed the milk ration averaged twice as heavy as those receiving no milk. On the thirteenth week they were almost three times as heavy, and although the difference later was not so marked, yet it continued to the end.

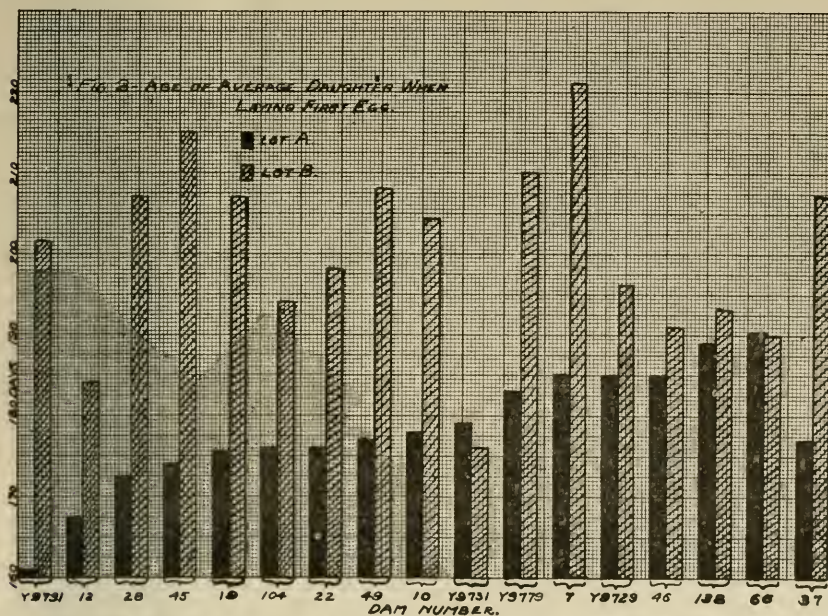


Fig. 2.—Age of Average Daughter When Laying First Egg.

**Mortality of the Chicks.**—From the beginning of the second to the beginning of the seventeenth week, when the cockerels were removed, 18 chickens died out of Lot A and 34 out of Lot B. Most of the deaths were caused by inflammation of the lungs due to the difficulty of properly brooding chickens with a mammoth brooder



in hot weather. At the start the brooders were operated at the same temperature, but on the approach of cold weather the chickens in Lot B, being smaller and not so well feathered, seemed to require and were given more heat than those in Lot A.

**Age When First Egg Was Laid.**—The first egg laid by any of the pullets was laid January 21, 1921, and the birds were transferred to their permanent laying quarters on the following day. Thereafter both lots of pullets ran together in one flock under practically free-range conditions.

Table IV shows the band numbers of the dams and the band numbers of their daughters in each lot, together with the age in days of each daughter when the first egg was laid.

**TABLE IV.—Age in Days When First Egg Was Laid**

| Number of Dam | LOT A              |               | LOT B              |               |
|---------------|--------------------|---------------|--------------------|---------------|
|               | Number of Daughter | Age First Egg | Number of Daughter | Age First Egg |
| Y9729         | 311                | 185           | 314                | 196           |
| Y9779         | 317                | 183           | 310                | 218           |
|               |                    |               | 344                | 202           |
| 66            | 308                | 200           | 338                | 190           |
|               | 313                | 182           |                    |               |
|               | 322                | 189           |                    |               |
| 104           | 330                | 176           | 303                | 194           |
| 138           | 327                | 190           | 341                | 199           |
|               | 351                | 188           | 337                | 183           |
|               |                    |               | 339                | 198           |
| Y9731         | 356                | 179           | 304                | 176           |
| Y9791         | 349                | 161           | 346                | 210           |
|               |                    |               | 321                | 193           |
| 45            | 333                | 174           | 312                | 219           |
|               |                    |               | 350                | 211           |
| 46            | 328                | 193           | 343                | 191           |
|               | 307                | 177           |                    |               |
| 12            | 301                | 175           | 305                | 180           |
|               | 309                | 160           | 316                | 178           |
|               |                    |               | 323                | 184           |
|               |                    |               | 306                | 194           |
| 22            | 325                | 176           | 319                | 198           |
| 49            | 324                | 178           | 329                | 208           |
|               | 320                | 171           |                    |               |
|               | 342                | 182           |                    |               |
| 10            | 332                | 172           | 353                | 219           |
|               | 355                | 184           | 352                | 196           |
|               |                    |               | 335                | 198           |
| 28            | 336                | 169           | 354                | 207           |
|               | 331                | 176           |                    |               |
| 7             | 302                | 185           | 348                | 221           |
| 19            | 326                | 168           | 334                | 217           |
|               | 315                | 183           | 345                | 197           |
| 37            | 347                | 177           | 340                | 207           |



**LOT A**  
**Well-Fed Fowls 107 Days Old**



**LOT B**  
**Poorly-Fed Fowls 107 Days Old**

**TABLE V.—Age of Pullets in Days When First Egg Was Laid Relative to Weight of Pullets January 22, 1921**

| Weight of Pullets in Pounds, January 22, 1921 | Age in Days |     |     |     |     |     |     |     |     |     |     |     |      |
|---|-------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|------|
|   | 160         | 165 | 170 | 175 | 180 | 185 | 190 | 195 | 200 | 205 | 210 | 215 | 220  |
| 1.4   |             |     |     |     |     |     |     |     |     |     | 1   | 1   | 2    |
| 1.5   |             |     |     |     |     |     |     |     |     |     |     |     | 2    |
| 1.6   |             |     |     |     |     |     |     |     |     |     |     | 1   | 1    |
| 1.7   |             |     |     |     |     |     |     |     |     | 1   |     |     | 1    |
| 1.8   |             |     |     |     |     | 1   |     |     |     |     |     |     | 1    |
| 1.9   |             |     |     |     |     |     |     | 1   |     | 1   | 1   |     | 3    |
| 2.0   |             |     |     |     |     |     |     |     | 1   |     |     |     | 2    |
| 2.1   |             |     |     | 1   |     |     | 1   |     | 3   |     |     |     | 5    |
| 2.2   |             |     |     | 1   |     |     |     |     | 1   |     | 1   |     | 3    |
| 2.3   |             |     |     |     |     |     |     | 1   |     |     |     |     | 1    |
| 2.4   |             |     |     |     |     | 2   |     | 1   |     |     |     |     | 3    |
| 2.5   |             |     |     |     | 1   |     | 1   | 2   |     |     |     |     | 4    |
| 2.6   |             |     |     |     | 1   |     | 1   | 1   |     |     |     |     | 3    |
| 2.7   |             |     |     |     |     |     |     | 1   | 1   |     |     |     | 2    |
| 2.8   |             |     |     |     | 1   |     |     |     |     |     |     |     | 1    |
| 2.9   |             |     | 2   | 1   | 2   | 2   | 1   |     |     |     |     |     | 8    |
| 3.0   |             |     | 2   | 3   | 1   | 1   |     |     |     |     |     |     | 7    |
| 3.1   | 1           |     |     |     |     |     | 1   |     |     |     |     |     | 2    |
| 3.2   |             |     |     |     |     |     |     |     |     |     |     |     |      |
| 3.3   |             |     |     | 1   |     |     |     |     |     |     |     |     | 1    |
| 3.4   |             |     |     |     |     | 1   |     |     |     |     |     |     | 1    |
| 3.5   |             |     |     |     |     |     |     |     |     |     |     |     |      |
| 3.6   |             |     |     |     | 1   |     |     |     |     |     |     |     | 1    |
| 3.7   |             |     |     | 1   |     |     |     |     |     |     |     |     | 1    |
|   | 1           |     | 4   | 8   | 7   | 7   | 5   | 7   | 6   | 2   | 3   | 1   | 4 55 |

Coefficient of Correlation —  $.72 \pm .05$ .

The pullets in Lot A were  $179 \pm 1.9$  days old when they began to lay, while in Lot B they were  $199.4 \pm 3.8$  days old, a difference in favor of the well-fed lot of  $20.4 \pm 4.2$  days in earliness of production.

Figure 2 shows graphically the age of the average daughters in the two lots when first egg was laid.

Table V shows the relationship between the weight of the pullets on January 22 and the age in days when the first egg was laid. In this table the age of the pullets in days at the time of laying their first egg is relative and the weight of the pullets on January 22 is subjective. For example, of the two fowls each weighing 1.4 pounds on January 22, one was 210 days old and the other was 215 days old when the first egg was laid.

The average, or mean, age of the pullets when laying the first egg was 189.9 days and their mean weight January 22 was 2.5 pounds.



The coefficient of correlation of  $-.72 \pm .05$  indicates that the heavier fowls of the flock were younger when laying the first egg than the lighter pullets. (The coefficient of correlation may vary from 1 through 0 to  $-1$ . A zero correlation would indicate that there was no relation between the weight of fowl and age when laying first egg. A positive correlation coefficient would indicate that the heavier fowls were older than those lighter in weight when they began to lay.

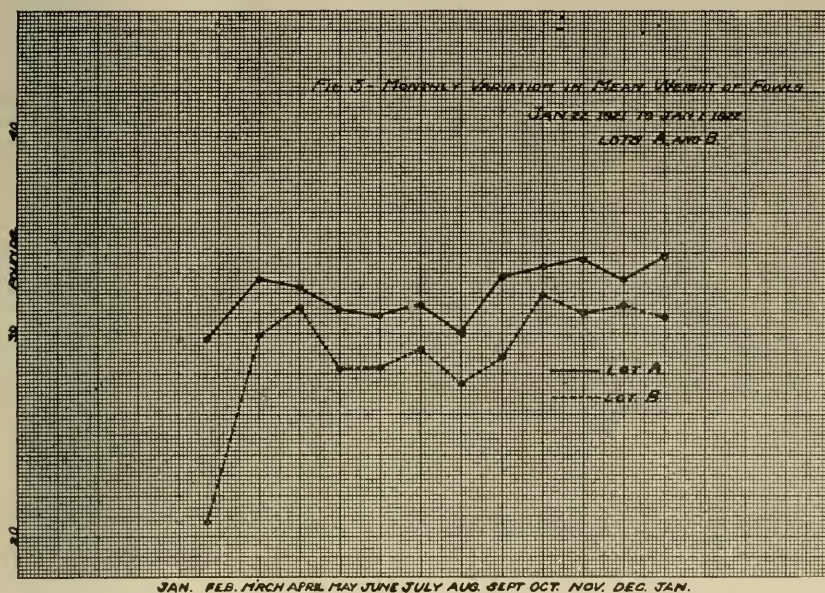


Fig. 3.—Monthly Variation in Mean Weight of Fowls.

## WEIGHT OF PULLETS

All the pullets were weighed on January 22 when they were transferred to their laying quarters, and beginning on March 1 they were weighed regularly at the beginning of each calendar month. In all cases this weighing was done at night soon after the pullets had gone to roost.

Table VI shows the weights of the pullets in Lot A, and Table VII the weights in Lot B. Fig. 3 shows the fluctuations in the average weights of the daughters.

Tables VI and VII and Figure 3 show that not only were the

pullets in Lot B smaller on January 22, when they were placed in the laying house with Lot A, but that they also permanently remained smaller. Due to the better balanced ration fed Lot B, beginning January 22, the pullets of this lot made a gain in live weight of almost one pound each by March 1, while the pullets of Lot A increased in weight only about one-third as much. The average weight of the average well-fed daughter for September, October, November, and December, 1921, was  $3.30 \pm .03$  pounds, while those that had been poorly fed averaged  $3.05 \pm .04$  pounds, or a difference of about 8 percent. Figure 7 shows that the difference in weight persisted during 1922 and it is evident that fowls that have been stunted by receiving a poor ration while young will never attain their normal weight even though fed a normal ration later.

TABLE VI.—Weight in Pounds of Pullets in Lot A, 1921

| No. of Dam     | No. of Daughter | January | March | April | May  | June | July | August | September | October | November | December |
|----------------|-----------------|---------|-------|-------|------|------|------|--------|-----------|---------|----------|----------|
| Y9729          | 311             | 3.4     | 3.3   | 3.7   | 3.7  | 3.6  | 3.7  | 3.6    | 3.7       | 3.6     | 3.1      | 3.1      |
| Y9779          | 317             | 3.0     | 3.8   |       |      |      |      |        |           |         |          |          |
| 66             | 308             | 2.7     | 3.6   | 3.1   | 3.1  | 3.2  | 2.9  | 2.9    | 3.3       | 3.7     | 3.7      | 3.7      |
|                | 313             | 2.9     | 3.4   | 3.4   | 3.7  | 3.6  | 3.6  | 2.8    | 3.2       | 3.9     | 3.9      | 4.0      |
|                | 322             | 2.9     | 3.3   | 3.4   | 3.5  | 3.4  | 3.4  | 3.4    | 3.6       | 2.9     | 3.4      | 3.7      |
| 104            | 330             | 2.9     | 3.3   | 3.2   | 3.0  | 2.6  | 2.9  | 2.6    | 3.2       | 3.2     | 3.1      | 3.3      |
| 138            | 327             | 2.6     | 3.3   | 2.9   | 2.8  | 2.8  | 2.9  | 2.4    | 3.0       | 3.3     | 3.5      | 3.3      |
|                | 351             | 3.1     | 3.3   | 3.2   | 3.1  | 3.2  | 3.2  | 3.3    | 3.0       | 3.1     | 3.7      | 4.1      |
| Y9731          | 356             | 2.9     | 3.2   | 3.2   | 2.8  | 2.9  | 2.9  | 2.3    | 2.9       | 3.3     | 3.4      | 2.9      |
| Y9791          | 349             | 3.1     | 3.1   | 3.2   | 2.9  | 3.0  | 3.1  | 2.7    | 3.2       | 3.3     | 3.7      | 3.2      |
| 45             | 333             | 3.3     | 3.2   | 3.4   | 3.4  | 3.2  | 3.1  | 3.0    | 3.4       | 3.5     | 3.1      | 3.3      |
| 12             | 301             | 3.0     | 2.9   | 3.0   | 2.8  | 2.8  | 2.8  | 2.8    | 2.8       | 3.3     | 3.4      | 3.6      |
|                | 309             | 3.7     | 3.8   | 3.7   | 3.6  | 3.6  | 3.4  | 3.5    | 3.8       | 3.7     | 4.1      | 2.9      |
| 22             | 325             | 3.0     | 3.4   | 3.4   | 3.0  | 3.1  | 3.2  | 3.4    | 3.4       | 2.7     | 2.8      | 3.0      |
| 49             | 324             | 3.0     | 3.3   | 3.4   | 3.3  | 3.4  | 3.4  | 3.3    | 3.5       | 3.1     | 3.3      | 3.8      |
|                | 320             | 2.9     | 3.4   | 3.2   | 2.8  | 2.5  | 3.2  | 3.1    | 3.2       | 3.0     | 3.0      | 3.1      |
|                | 342             | 3.6     | 3.7   | 3.8   | 3.5  | 3.5  | 3.3  | 3.7    | 3.8       | 3.9     | 3.2      | 3.7      |
| 10             | 332             | 2.9     | 3.4   | 3.4   | 3.4  | 3.0  | 3.2  | 3.0    | 3.3       | 3.6     | 3.8      | 3.6      |
|                | 355             | 2.4     | 3.0   | 2.8   | 3.0  | 2.7  | 2.8  | 2.9    | 3.0       | 3.1     | 3.2      | 2.6      |
| 28             | 336             | 3.0     | 3.0   | 3.1   | 2.7  | 2.6  | 2.8  | 2.6    | 2.6       | 2.9     | 3.3      | 3.4      |
|                | 331             | 2.1     | 3.5   | 3.5   | 3.1  | 3.3  | 3.2  | 3.3    | 3.7       | 3.1     | 2.9      | 3.2      |
| 7              | 302             | 2.9     | 2.2   | 2.4   | 3.2  | 3.2  | 3.1  | 3.2    | 3.4       | 3.5     | 3.9      | 3.2      |
| 19             | 326             | 3.0     | 3.4   | 3.3   | 3.2  | 3.2  | 3.1  | 3.2    | 2.6       | 2.8     | 3.1      | 3.5      |
|                | 315             | 2.9     | 3.4   | 3.3   | 3.3  | 3.0  | 3.0  | 2.7    | 3.4       | 3.8     | 4.0      | 3.2      |
| 37             | 347             | 3.0     | 3.0   | 3.0   | 3.1  | 3.0  | 3.0  | 2.7    | 3.2       | 3.2     | 2.7      | 2.7      |
| 46             | 328             | 2.5     | 3.4   | 2.6   |      |      |      |        |           |         |          |          |
|                | 307             | 2.8     | 3.4   | 3.3   |      |      |      |        |           |         |          |          |
| Average Weight |                 | 2.97    | 3.27  | 3.23  | 3.12 | 3.09 | 3.14 | 3.00   | 3.28      | 3.33    | 3.36     | 3.27     |

TABLE VII.—Weight in Pounds of Pullets in Lot B, 1921

| No. of Dam     | No. of Daughter | January 22 | March 1 | April 1 | May 1 | June 1 | July 1 | August 1 | September 1 | October 1 | November 1 | December 1 |
|----------------|-----------------|------------|---------|---------|-------|--------|--------|----------|-------------|-----------|------------|------------|
| Y9729          | 314             | 2.4        | 3.2     | 3.4     | 3.4   | 3.4    | 3.4    | 3.6      | 3.4         | 3.4       | 2.9        | 3.0        |
| Y9779          | 310             | 1.9        | 2.5     |         |       |        |        |          |             |           |            |            |
|                | 344             | 2.0        | 3.0     |         |       |        |        |          |             |           |            |            |
| 66             | 338             | 2.1        | 2.7     | 2.9     | 2.7   | 2.7    | 2.8    | 2.2      | 2.6         | 3.1       | 3.3        | 3.3        |
| 104            | 303             | 2.7        | 3.7     | 3.7     | 3.0   | 3.0    | 3.1    | 2.6      | 2.5         | 2.7       | 3.0        | 3.8        |
| 138            | 341             | 2.1        | 3.4     | 3.2     | 3.1   | 3.0    | 2.5    | 2.6      | 3.3         | 3.5       | 2.8        | 2.7        |
|                | 337             | 2.4        | 3.1     | 3.3     | 2.6   | 2.8    | 2.7    | 2.6      | 2.7         | 3.1       | 3.7        | 3.3        |
|                | 339             | 2.1        | 3.1     | 3.1     | 2.9   | 2.7    | 2.9    | 2.3      | 3.2         | 3.4       | 2.9        | 3.1        |
| Y9731          | 304             | 2.2        | 2.9     | 2.9     | 2.6   | 2.7    | 2.9    | 2.5      | 2.4         | 2.6       | 3.0        | 3.1        |
| Y9791          | 346             | 1.9        | 2.8     | 3.2     | 2.7   | 2.9    | 2.9    | 2.5      | 2.6         | 3.1       | 3.4        | 3.6        |
|                | 321             | 2.3        | 3.1     | 2.9     | 2.7   | 2.7    | 2.5    | 2.2      | 2.5         | 3.1       | 3.4        | 3.3        |
| 45             | 312             | 1.5        | 2.5     | 3.1     | 2.8   | 2.6    | 2.9    | 2.5      | 2.5         | 3.4       | 3.2        | 3.3        |
|                | 350             | 1.4        | 2.4     | 2.3     | 2.2   | 2.2    | 2.0    | 2.2      | 2.5         | 2.7       | 3.1        | 3.0        |
| 12             | 305             | 2.5        | 3.3     | 3.1     | 3.0   | 3.1    | 3.1    | 3.1      | 3.3         | 3.3       | 2.8        | 2.5        |
|                | 316             | 2.6        | 3.2     | 3.3     | 3.5   | 2.8    | 3.0    | 2.6      | 3.2         | 3.5       | 3.7        | 3.0        |
|                | 323             | 1.8        | 2.9     | 2.9     | 2.6   | 2.8    | 2.8    | 2.4      | 3.0         | 3.3       | 3.3        | 3.2        |
|                | 306             | 2.6        | 3.9     | 3.6     | 3.6   | 3.7    | 4.0    | 4.2      | 3.9         | 4.4       | 4.6        | 3.1        |
| 22             | 319             | 2.1        | 3.0     | 3.0     | 2.5   | 2.2    | 2.5    | 2.3      | 2.7         | 3.2       | 3.3        | 3.0        |
| 49             | 329             | 2.2        | 3.1     | 3.2     | 3.2   | 3.2    | 3.1    | 2.7      | 3.0         | 3.1       | 3.2        | 3.3        |
| 10             | 353             | 1.6        | 2.1     | 2.6     | 2.5   | 2.5    |        |          |             |           |            |            |
|                | 352             | 2.0        | 3.1     | 3.1     | 3.2   | 3.0    | 3.1    | 2.6      | 2.9         | 3.4       | 3.3        | 2.7        |
|                | 335             | 2.2        | 3.4     | 3.1     | 2.6   | 2.6    | 2.9    | 2.7      | 2.9         | 2.4       | 2.5        | 2.9        |
| 28             | 354             | 1.7        | 2.7     | 2.9     | 2.4   | 2.5    | 2.6    | 2.9      | 2.8         | 3.1       | 2.5        | 2.5        |
| 7              | 348             | 1.5        | 2.4     | 3.1     | 2.7   | 2.9    | 3.1    | 2.6      | 2.8         | 3.0       | 3.3        | 3.5        |
| 19             | 334             | 1.4        | 2.4     | 3.0     | 3.0   | 2.4    | 2.8    | 2.9      | 3.0         | 2.8       | 3.0        | 3.2        |
|                | 345             | 2.5        | 3.8     | 3.6     | 3.5   | 3.4    | 3.3    | 3.5      | 3.5         | 3.8       | 3.1        | 3.4        |
| 437            | 340             | 1.9        | 2.8     | 3.0     | 2.5   | 2.8    | 2.9    | 3.4      | 3.1         | 2.7       | 2.5        | 2.5        |
| 46             | 343             | 2.4        | 3.3     | 3.2     |       |        |        |          |             |           |            |            |
| Average Weight |                 | 2.07       | 2.99    | 3.13    | 2.82  | 2.83   | 2.92   | 2.75     | 2.88        | 3.19      | 3.10       | 3.14       |

## MANAGEMENT OF PULLETS

After the pullets were placed in their laying quarters, they had free access to dry mash in a hopper, and once a day a mixture of corn and oats was scattered in the litter covering the floor of the poultry house. The dry mash was composed of corn meal, 2 parts, and 1 part each of wheat bran, wheat middlings, and meat scrap.



At the start, in order that they might not nest outside and the eggs be unrecorded, the pullets were confined to the house until after practically all eggs for the day had been laid. Later in the season, after they had become fully accustomed to the trap nests, they were allowed free range on a bluegrass sod.

In spite of the utmost care in trapping, 2.4 percent of the eggs were laid outside the trap nests and in the following tables showing egg production and egg weights, these eggs have been disregarded.

### Number and Weight of Eggs Laid

The eggs were weighed regularly early in the morning following the day on which they were laid.

As shown by Table IV and subsequent tables, the dams, in several cases, had unequal numbers of daughters in the two lots. The daughters of certain dams may be better layers or may lay larger eggs than the daughters of certain other dams, and if the mean egg production or the mean weight of the eggs laid by all the daughters in each lot were considered, this factor might obscure the effect of the two rations. To overcome this difficulty whenever a dam had more than one daughter in either lot the mean production of all of her daughters in that particular lot was taken in calculating the results. For example, in Table X the three daughters of Dam 66 gave a mean egg production of 129 eggs weighing 6,588.17 grams. The expression "average daughter" is used in this connection.

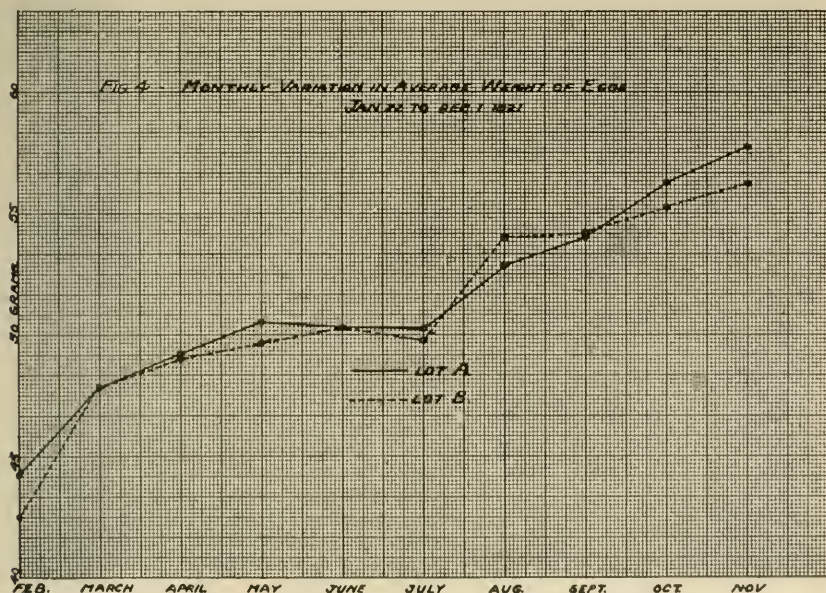


Fig. 4.—Monthly Variation in Average Weight of Eggs.

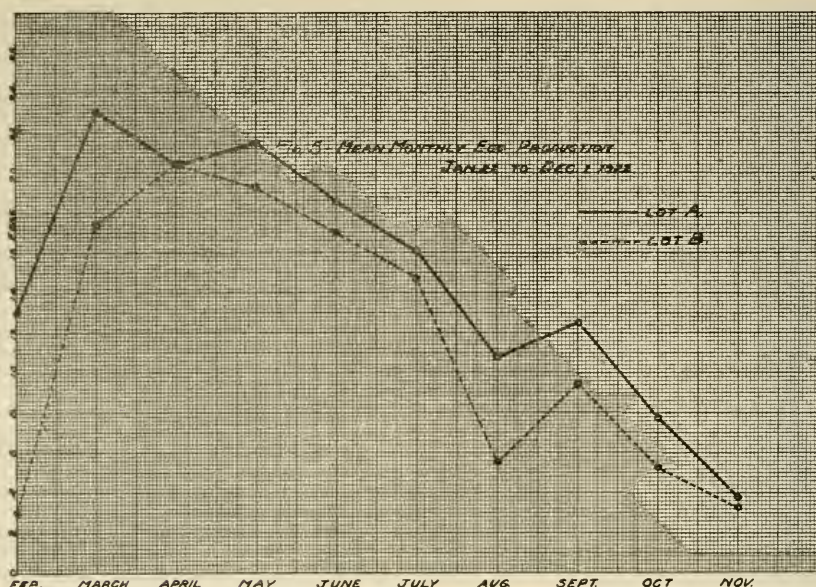
Table VIII shows the mean number of eggs and mean weight of eggs in grams laid by the "average daughter" per month until December, 1921. These data are shown graphically in Figures 4 and 5.

Particular attention has been given to the weight of the eggs laid by the two lots of pullets, for should it appear that the pullets poorly fed while young lay smaller eggs than those laid by the other lot, then it might be logical to conclude that the unfavorable early environment tends to reduce the vigor of the progeny.

See Memoir 31, Cornell Experiment Station, Ithaca, N. Y.

**TABLE VIII.—Mean Egg Production and Egg Weight, Lots A and B, January 22, 1921, to December 1, 1921**

| Date            | LOT A                         |                                 | LOT B                         |                                 |
|-----------------|-------------------------------|---------------------------------|-------------------------------|---------------------------------|
|                 | Average No. Eggs Per Daughter | Average Egg Weight Per Daughter | Average No. Eggs Per Daughter | Average Egg Weight Per Daughter |
| Jan.-Feb. ....  | 13.15                         | 44.57                           | 3.02                          | 42.55                           |
| March .....     | 22.94                         | 47.93                           | 17.04                         | 47.89                           |
| April .....     | 20.31                         | 49.19                           | 20.49                         | 49.11                           |
| May .....       | 21.50                         | 50.48                           | 19.16                         | 49.69                           |
| June .....      | 18.93                         | 50.47                           | 17.18                         | 50.47                           |
| July .....      | 16.04                         | 50.28                           | 13.93                         | 49.79                           |
| August .....    | 10.71                         | 52.72                           | 5.53                          | 53.96                           |
| September ..... | 12.53                         | 54.07                           | 9.40                          | 54.12                           |
| October .....   | 7.83                          | 56.27                           | 5.35                          | 55.25                           |
| November .....  | 4.79                          | 57.69                           | 3.09                          | 56.08                           |



**Fig. 5.—Mean Monthly Egg Production.**



The weight of the eggs increased with a fair degree of regularity during the period covered by the table.

**Weight of Fowls and Number of Eggs Laid.**—What then is the relationship between the weight of the fowls and the number of eggs laid? In Table IX the average of the seven weighings of each fowl, March to September, was considered the average weight, and the number of eggs covered the total recorded production of each individual until September 1. The table is arranged without reference to the previous treatment of the pullets and no effort is made to balance the production or weight of one set of sisters against the other as in former tables. The table shows that the heavier fowls laid more eggs than did those lighter in weight.

**TABLE IX.—Correlation of Egg Production (Number of Eggs Laid to September 1) Relative to Average Weight of Fowl**

|   |      | Number of Eggs Laid |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     |     |     |     |     |     |    |
|---|------|---------------------|----|----|----|----|----|----|----|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|----|
|   |      | 55                  | 60 | 65 | 70 | 75 | 80 | 85 | 90 | 95 | 100 | 105 | 110 | 115 | 120 | 125 | 130 | 135 | 140 | 145 | 150 | 155 |    |
| Average Weight of Fowls March<br>to September | Lbs. | 1                   |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     |     |     |     |     |     | 1  |
|   | 2.3  |                     |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     |     |     |     |     |     |    |
|   | 2.4  |                     |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     |     |     |     |     |     |    |
|   | 2.5  |                     |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     |     |     |     |     |     |    |
|   | 2.6  |                     |    |    |    |    |    |    |    |    |     | 1   | 1   |     |     |     |     |     |     |     |     |     | 2  |
|   | 2.7  |                     |    |    |    | 1  |    |    | 1  |    |     | 1   |     |     |     |     |     |     |     |     |     |     | 3  |
|   | 2.8  |                     |    |    | 1  | 1  | 1  |    |    |    |     | 1   | 1   | 1   | 2   |     |     |     |     |     |     |     | 6  |
|   | 2.9  | 1                   |    |    | 1  |    |    |    |    | 1  | 2   | 1   | 1   | 1   |     |     | 1   |     |     |     |     |     | 8  |
|   | 3.0  |                     |    |    |    |    | 2  |    |    | 1  |     | 1   | 1   |     |     | 1   |     |     |     | 1   |     |     | 7  |
|   | 3.1  |                     |    |    |    |    |    |    |    | 1  | 1   |     |     | 1   |     |     |     |     |     |     |     |     | 3  |
|   | 3.2  | 1                   |    |    |    |    |    |    |    |    |     |     | 1   |     | 1   |     | 1   |     |     | 1   |     |     | 5  |
|   | 3.3  |                     |    |    |    |    |    |    |    |    |     |     |     |     | 1   | 1   |     |     |     |     | 1   |     | 3  |
|   | 3.4  |                     |    |    |    |    |    |    |    |    |     |     |     |     | 1   | 1   | 2   |     |     | 1   | 2   |     | 5  |
|   | 3.5  |                     |    |    |    |    |    |    | 1  |    |     |     |     |     |     |     |     |     |     |     |     |     | 1  |
|   | 3.6  |                     |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     | 1   |     |     | 1   |     | 2  |
|   | 3.7  |                     |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     |     |     |     |     |     |    |
|   | 3.8  |                     |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     |     |     | 1   |     |     | 1  |
| 3.9   |      |                     |    |    |    |    |    |    |    |    |     |     |     |     |     |     |     | 1   |     |     |     | 1   |    |
|   |      | 3                   |    |    | 1  | 2  | 3  |    | 2  | 3  | 3   | 4   | 4   | 3   | 4   | 2   | 4   | 1   | 1   | 4   | 2   | 2   | 48 |

Coefficient of Correlation =  $+.63 \pm .06$ .

Tables X and XI summarize the egg production and egg weight to December 1, 1921, at which time most of the fowls were moulting and had ceased to lay. Figure 6 shows the data graphically.

TABLE X.—Summary of Egg Production and Egg Weight to December 1, 1921. Lot A.

| No. of Dam    | No. of Daughter | Number Eggs Laid | Total Wt. of Eggs (Grams) | Average No. of Eggs | Average Total Wt. of Eggs (Grams) | Average Egg Weight Per Daughter |
|---------------|-----------------|------------------|---------------------------|---------------------|-----------------------------------|---------------------------------|
| Y9729         | 311             | 180              | 9121.11                   | 180                 | 9121.11                           | 50.67                           |
| 66            | 308             | 56               | 2766.82                   | 129                 | 6588.17                           | 51.07                           |
|               | 313             | 166              | 8639.52                   |                     |                                   |                                 |
|               | 322             | 165              | 8358.16                   |                     |                                   |                                 |
| 104           | 330             | 84               | 4155.15                   | 84                  | 4155.15                           | 49.46                           |
| 138           | 327             | 149              | 8046.39                   | 129                 | 6670.33                           | 51.71                           |
|               | 351             | 109              | 5294.28                   |                     |                                   |                                 |
| Y9731         | 356             | 150              | 6933.15                   | 150                 | 6933.15                           | 46.22                           |
| Y9791         | 349             | 165              | 8703.98                   | 165                 | 8703.98                           | 52.75                           |
| 45            | 333             | 140              | 6931.33                   | 140                 | 6931.33                           | 49.51                           |
| 12            | 301             | 146              | 7204.57                   | 165.5               | 8271.39                           | 49.98                           |
|               | 309             | 185              | 9338.22                   |                     |                                   |                                 |
| 22            | 325             | 162              | 7944.56                   | 162                 | 7944.56                           | 49.04                           |
| 49            | 324             | 156              | 7712.93                   | 150                 | 7327.51                           | 48.85                           |
|               | 320             | 125              | 5823.34                   |                     |                                   |                                 |
|               | 342             | 169              | 8446.27                   |                     |                                   |                                 |
| 10            | 332             | 177              | 9294.24                   | 173.5               | 8910.64                           | 51.36                           |
|               | 355             | 170              | 8527.05                   |                     |                                   |                                 |
| 28            | 336             | 122              | 5621.45                   | 143.5               | 7053.83                           | 49.16                           |
|               | 331             | 165              | 8486.22                   |                     |                                   |                                 |
| 7             | 302             | 187              | 9685.88                   | 187                 | 9685.88                           | 51.80                           |
| 19            | 326             | 132              | 7003.25                   | 148                 | 7824.49                           | 52.87                           |
|               | 315             | 164              | 8645.73                   |                     |                                   |                                 |
| 37            | 347             | 130              | 6408.03                   | 130                 | 6408.03                           | 49.29                           |
| Total .....   |                 | 3554             |                           | 2236.5              | 112529.55                         |                                 |
| Average ..... |                 | 148.08           |                           | 149.1               | 50.31                             |                                 |

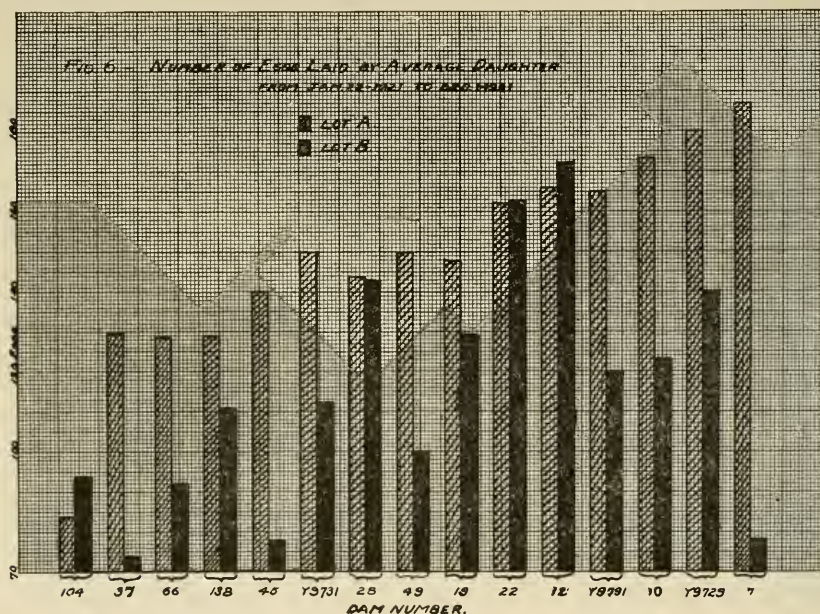


Fig. 6.—Number of Eggs Laid by Average Daughter.

TABLE XI.—Summary of Egg Production and Egg Weight to December 1, 1921. Lot B.

| No. of Dam    | No. of Daughter | Number Eggs Laid | Total Wt. of Eggs (Grams) | Average No. of Eggs | Average Total Wt. of Eggs (Grams) | Average Egg Weight Per Daughter |
|---------------|-----------------|------------------|---------------------------|---------------------|-----------------------------------|---------------------------------|
| Y9729         | 314             | 140              | 7267.11                   | 140                 | 7267.11                           | 51.91                           |
| 66            | 338             | 92               | 4486.40                   | 92                  | 4486.40                           | 48.76                           |
| 104           | 303             | 94               | 4773.68                   | 94                  | 4773.68                           | 50.78                           |
| 138           | 341             | 106              | 5380.25                   | 110.67              | 5656.78                           | 51.12                           |
|               | 337             | 98               | 5075.33                   |                     |                                   |                                 |
|               | 339             | 128              | 6514.75                   |                     |                                   |                                 |
| Y9731         | 304             | 112              | 4745.10                   | 112                 | 4745.10                           | 42.37                           |
| Y9791         | 346             | 74               | 3680.60                   | 119                 | 5733.97                           | 48.18                           |
|               | 321             | 164              | 7787.35                   |                     |                                   |                                 |
| 45            | 312             | 83               | 4358.49                   | 77.5                | 3935.01                           | 50.77                           |
|               | 350             | 72               | 3511.53                   |                     |                                   |                                 |
| 12            | 305             | 180              | 8808.38                   | 172                 | 8877.57                           | 51.61                           |
|               | 316             | 138              | 7107.70                   |                     |                                   |                                 |
|               | 323             | 183              | 8913.99                   |                     |                                   |                                 |
|               | 306             | 187              | 10680.22                  |                     |                                   |                                 |
| 22            | 319             | 163              | 8155.41                   | 163                 | 8155.41                           | 50.03                           |
| 49            | 329             | 100              | 5340.81                   | 100                 | 5340.81                           | 53.40                           |
| 10            | 352             | 135              | 6417.38                   | 123                 | 6119.30                           | 49.75                           |
|               | 335             | 111              | 5821.22                   |                     |                                   |                                 |
| 28            | 354             | 143              | 7389.22                   | 143                 | 7389.22                           | 51.67                           |
| 7             | 348             | 78               | 4032.28                   | 78                  | 4032.28                           | 51.70                           |
| 19            | 334             | 126              | 6289.50                   | 129                 | 6653.78                           | 51.58                           |
|               | 345             | 132              | 7018.06                   |                     |                                   |                                 |
| 37            | 340             | 74               | 3627.98                   | 74                  | 3627.98                           | 49.03                           |
| Total .....   |                 | 2913             |                           | 1727.17             | 86794.40                          |                                 |
| Average ..... |                 | 121.37           |                           | 115.14              | 50.25                             |                                 |

**Comparative Egg Production.**—During the period which ended March 1, the pullets that had been well fed while young laid about four times as many eggs as did those poorly fed and in March they reached their maximum production for the season, averaging 22.94 eggs each. The maximum production of the poorly-fed daughters was reached one month later with an average of 20.49 eggs each, this production being slightly greater than that of the other lot for that particular month.

From the two maxima in March and April the production dropped with fair regularity until the end of the period covered by this report. It is to be observed that in Lot A the daughters which had been well fed led in production with the exceptions noted from month to month.

**Average Egg Weight.**—During the January-February period the eggs from Lot A averaged about two grams heavier than those from Lot B, but during the next few months the difference was



small, Lot A laying slightly heavier eggs. In August this condition was reversed, Lot B laying slightly heavier eggs. This result, however, was clearly due to the low average egg production of Lot B, due to extremely hot weather and to the relatively heavy production of Pullet 306 which laid 20 eggs, or more than one-eighth of the entire number for Lot B, with an average weight of more than 60 grams. In September, Lot B led slightly in egg weight, but in October and November Lot A led by about one gram per egg.

**Mean Egg Production.**—The mean egg production until December 1 of the “average daughters” in Lot A was  $149.3 \pm 4.2$  and of the “average daughters” of Lot B  $115.6 \pm 4.8$ , or a difference of  $33.7 \pm 6.4$  eggs per bird in favor of the well-fed lot. The 24 well-fed pullets laid 3554 recorded eggs, or  $148.08 \pm 4.4$  eggs per fowl, while the 24 poorly-fed ones laid 2913 eggs, or  $121.3 \pm 4.8$  eggs per bird, a difference of  $26.8 \pm 6.5$  eggs in favor of the well-fed pullets. Whichever way the results are calculated the differences in production are large and striking.

It may be observed that if a poorly-balanced ration fed to little chickens should be the means of restricting the number of eggs that the pullets will lay later, then the reverse should be true that an ideal ration should increase the number of eggs. In order to obtain the maximum egg production, skillful breeding and skillful feeding and brooding of the little chickens must go hand in hand.

**Mean Egg Weight.**—When the average egg weight for the two lots is considered, the difference is found to be small. For Lot A,  $M = 50.24 \pm .29$  and for Lot B,  $M = 50.20 \pm .43$ . The data do not show that the size of the egg was reduced by the insufficient ration received by the pullets of Lot B. The difference, if any, would naturally be small, at least in the first generation.

**Heredity.**—Tables X and XI show that, in some cases, heredity is such a powerful influence that it is able to overcome any ordinary adverse environmental factor which might affect the individual during the formative period. Pullet 306, a daughter of Hen 12, although poorly fed while young, laid as many egg (187) as any member of the flock, laid the heaviest eggs, the greatest total weight of eggs, and moreover was the heaviest bird in either Lot A or Lot B.

Of the three pullets which laid 180 or more eggs in Lot B, all were daughters of Hen 12, and of the two birds in Lot A laying 180 or more eggs, one was a daughter of Hen 12. In other words, of the five individuals laying 180 eggs or more, four were daughters of Hen 12.

## SECOND YEAR'S EXPERIMENT

During the second year no change was made in the ration supplied to the fowls in Lots A and B and they continued to run together in one flock. In the summer of 1921, eggs from these fowls were incubated and the chicks handled as in the earlier experiment. The chicks receiving the two rations were designated as Lots C and D. Lot C received the well balanced ration. The first year's record for these birds begins on page 28.

**Weight of Hens in Lots A and B.**—Tables XII and XIII show the weight of each bird and the mean weight of the "average daughter" for each month of the year. Figure 7 shows this graphically.

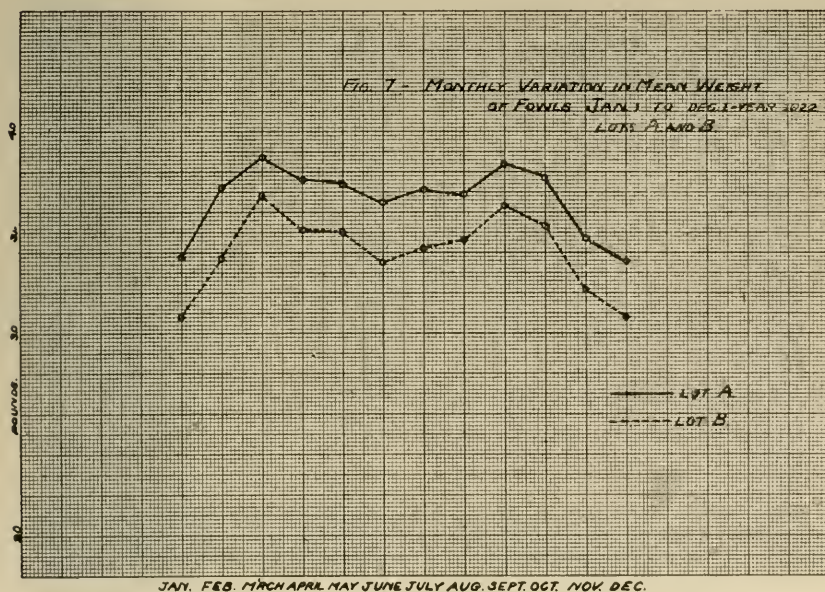


Fig. 7.—Monthly Variation in Mean Weight of Fowls, Jan. 1922 to Dec. 1922.

TABLE XII.—Weights of Hens in Lot A in Pounds

| No. of Dam          | No. of Daughter | January | February | March | April | May  | June | July | August | September | October | November | December |
|---------------------|-----------------|---------|----------|-------|-------|------|------|------|--------|-----------|---------|----------|----------|
| Y9729               | 311             | 3.5     | 3.9      | 4.2   | 4.0   | 4.1  | 4.1  | 4.2  | 4.1    | 4.1       | 4.4     | 3.7      | 3.4      |
| 66                  | 308             | 3.7     | 4.2      | 4.4   | 4.1   | 4.0  | 3.7  | 3.9  | 4.3    | 4.2       | 4.2     | 3.4      | 3.4      |
|                     | 313             | 3.5     | 4.2      | 4.2   | 4.1   | 3.9  | 4.0  | 4.1  | 4.0    | 4.2       | 4.0     | 4.5      | 3.4      |
|                     | 322             | 3.5     | 4.0      | 4.1   | 3.8   | 4.1  | 3.9  | 4.2  | 4.2    | 4.3       | 3.7     | 3.4      | 3.8      |
| 104                 | 330             | 3.3     | 3.9      | 3.4   | 3.7   | 3.6  | 3.6  | 3.6  | 3.6    | 3.8       | 3.8     | 3.3      | 2.9      |
| 138                 | 327             | 2.9     | 3.3      | 3.8   | 3.6   | 3.3  | 3.2  | 3.2  | 3.3    | 3.5       | 3.0     | 3.7      | 3.0      |
|                     | 351             | 4.3     | 4.6      | 4.1   | 3.5   | 3.7  | 3.7  | 3.7  | 3.6    | 4.1       | 4.2     | 4.1      | 3.1      |
| Y9731               | 356             | 2.9     | 3.5      | 3.5   | 3.4   | 3.5  | 3.5  | 3.5  | 3.4    | 3.3       | 3.4     | 3.4      | 2.8      |
| Y9791               | 349             | 3.3     | 3.4      | 3.4   | 3.4   | 3.7  | 3.8  |      |        |           |         |          |          |
| 45                  | 333             | 3.6     | 4.1      | 3.9   | 3.9   | 3.8  | 3.6  | 3.6  | 2.8    | 3.5       | 3.9     | 3.3      | 3.5      |
| 12                  | 301             | 3.6     | 3.4      | 3.8   | 3.6   | 3.3  | 3.4  | 3.4  | 3.6    | 3.7       | 4.0     | 3.2      | 2.9      |
|                     | 309             | 3.2     | 4.1      | 4.0   | 4.1   | 3.8  | 3.9  | 3.9  | 3.8    | 4.0       | 3.3     | 3.0      | 4.1      |
| 22                  | 325             | 3.2     | 3.4      | 3.8   | 3.5   | 3.5  | 3.4  | 3.8  | 4.1    | 4.1       | 4.0     | 3.0      | 3.1      |
| 49                  | 324             | 4.2     | 4.3      | 4.4   | 4.2   | 4.0  | 4.0  | 3.8  | 4.2    | 4.2       | 3.9     | 3.5      | 4.1      |
|                     | 320             | 3.5     | 3.6      | 3.7   | 3.7   | 3.5  | 3.5  | 3.5  | 3.5    | 3.3       | 3.1     | 3.3      | 3.6      |
|                     | 342             | 4.1     | 4.6      | 4.5   | 4.3   | 4.3  | 4.0  | 4.1  | 3.8    | 4.6       | 4.7     | 3.8      | 3.9      |
| 10                  | 332             | 3.0     | 3.4      | 3.8   | 3.6   | 3.7  | 3.7  | 3.7  | 3.8    | 4.0       | 3.5     | 3.2      | 3.8      |
|                     | 355             | 2.8     | 3.1      | 3.5   | 3.0   | 3.4  | 3.2  | 3.2  | 2.9    | 3.5       | 3.1     | 3.6      | 3.2      |
| 28                  | 336             | 3.4     | 3.6      | 3.7   | 3.5   | 3.6  | 3.4  | 3.4  | 3.4    | 3.7       | 3.1     | 3.0      | 3.2      |
|                     | 331             | 3.4     | 3.7      | 4.1   | 4.0   | 4.1  | 3.7  | 3.8  | 3.9    | 3.5       | 3.4     | 3.5      | 3.5      |
| 7                   | 302             | 3.4     | 3.7      | 4.2   | 4.2   | 4.0  | 3.9  | 4.0  | 4.1    | 4.1       | 4.4     | 3.9      | 3.4      |
| 19                  | 326             | 3.6     | 4.0      | 4.3   | 4.2   | 3.8  | 3.8  | 3.9  | 3.8    | 3.6       | 3.1     | 3.5      | 3.8      |
|                     | 315             | 3.4     | 3.9      | 4.3   | 4.1   | 4.1  | 3.6  | 3.6  | 4.0    | 4.5       | 4.3     | 4.6      | 4.3      |
| 37                  | 347             | 2.9     | 3.1      | 3.5   | 3.6   | 3.5  | 3.4  | 3.5  | 3.5    | 3.6       | 3.6     | 3.0      | 3.1      |
| Average<br>Daughter |                 | 3.38    | 3.72     | 3.87  | 3.76  | 3.74 | 3.65 | 3.71 | 3.69   | 3.84      | 3.77    | 3.47     | 3.36     |



TABLE XIII.—Weights of Hens in Lot B in Pounds

| No. of Dam       | No. of Daughter | January | February | March | April | May  | June | July | August | September | October | November | December |
|------------------|-----------------|---------|----------|-------|-------|------|------|------|--------|-----------|---------|----------|----------|
| Y9729            | 314             | 3.2     | 3.5      | 3.8   | 3.7   | 3.7  | 3.7  | 3.9  | 4.1    | 4.0       | 3.2     | 3.4      | 3.4      |
| 66               | 338             | 2.3     | 3.7      | 3.5   | 3.1   | 3.1  | 3.1  | 3.3  | 3.2    | 3.3       | 3.0     | 3.0      | 3.3      |
| 104              | 303             | 2.8     | 3.4      | 3.9   | 3.8   | 3.7  | 3.6  | 3.2  | 3.4    | 3.6       | 3.0     | 3.1      | 3.3      |
| 138              | 341             | 3.0     | 3.6      | 3.7   | 3.6   | 3.4  | 3.4  | 3.4  | 3.5    | 3.9       | 3.8     | 3.0      | 2.8      |
|                  | 337             | 2.9     | 3.2      | 3.6   | 3.4   | 3.4  | 3.3  | 3.2  | 3.2    | 3.5       | 3.7     | 2.9      | 2.9      |
|                  | 339             | 3.3     | 3.3      | 3.5   | 3.3   | 3.3  | 3.2  | 2.8  |        |           |         |          |          |
| Y9731            | 304             | 3.2     | 3.4      | 3.7   | 3.3   | 3.3  | 3.2  | 3.2  | 3.3    | 3.5       | 3.6     | 3.6      | 2.9      |
| Y9791            | 346             | 3.6     | 3.8      | 3.9   | 3.6   | 3.5  | 3.4  |      |        |           |         |          |          |
|                  | 321             | 3.4     | 2.7      | 3.4   |       |      |      |      |        |           |         |          |          |
| 45               | 312             | 3.5     | 3.6      | 3.7   | 3.6   | 3.5  | 3.5  | 3.5  | 3.2    | 3.6       | 3.4     | 3.1      | 3.2      |
|                  | 350             | 2.8     | 3.1      | 3.2   | 2.9   | 2.8  | 2.6  | 2.7  | 2.6    | 2.7       | 2.3     | 2.3      | 2.6      |
| 12               | 305             | 2.8     | 3.0      | 4.0   | 3.6   | 3.6  | 3.3  | 3.5  | 3.8    | 4.0       | 3.0     | 3.3      | 3.5      |
|                  | 316             | 3.2     | 3.5      | 4.1   | 3.7   | 3.9  | 3.9  | 3.9  | 4.0    | 4.1       | 4.1     | 4.0      | 3.3      |
|                  | 323             | 2.6     | 2.7      | 3.2   | 3.3   | 3.3  | 3.2  | 3.3  | 2.7    | 3.6       | 3.8     | 3.5      | 3.6      |
|                  | 306             | 3.2     | 3.5      | 4.2   | 4.5   | 4.6  | 4.5  | 4.7  | 4.9    | 4.9       | 5.2     | 4.1      | 3.4      |
| 22               | 319             | 2.6     | 2.9      | 3.2   | 3.0   | 3.4  | 2.9  | 3.1  | 3.3    | 3.3       | 3.5     | 2.7      | 2.8      |
| 49               | 329             | 3.5     | 3.6      | 3.9   | 3.8   | 3.8  | 3.6  | 3.9  | 3.7    | 3.9       | 3.7     | 3.1      | 3.1      |
| 10               | 352             | 3.0     | 3.3      | 3.6   | 3.5   | 3.7  | 3.5  | 3.4  | 3.7    | 3.5       | 3.7     | 3.3      | 2.9      |
|                  | 335             | 2.9     | 3.4      | 3.4   | 3.2   | 3.1  | 3.2  | 3.4  | 3.3    | 3.2       | 3.3     | 3.4      | 3.4      |
| 28               | 354             | 2.7     | 2.6      | 3.4   | 3.3   | 3.2  | 2.9  | 3.3  | 3.2    | 3.5       | 3.7     | 2.8      | 2.6      |
| 7                | 348             | 3.6     | 3.8      | 4.0   | 3.8   | 3.6  | 3.5  | 3.5  | 3.5    | 3.9       | 4.1     | 3.2      | 3.2      |
| 19               | 334             | 3.5     | 3.4      | 3.9   | 3.5   | 3.7  | 3.3  | 3.3  | 3.3    | 3.5       | 3.6     | 3.2      | 3.1      |
|                  | 345             | 3.5     | 4.1      | 4.5   | 4.3   | 4.3  | 4.2  | 4.1  | 4.5    | 4.5       | 4.4     | 4.5      | 3.5      |
| 37               | 340             | 2.9     | 3.4      | 3.5   | 3.5   | 3.5  | 3.2  | 3.3  | 3.3    | 3.5       | 3.5     | 3.6      | 2.9      |
| Average Daughter |                 | 3.08    | 3.37     | 3.68  | 3.51  | 3.50 | 3.35 | 3.42 | 3.46   | 3.63      | 3.53    | 3.22     | 3.08     |

During the last three months of the test the average weight of the fowls in Lot A was  $3.53 \pm .05$  pounds and for Lot B  $3.28 \pm .04$  pounds or an average difference of about one-fourth pound per bird. As these fowls were now in their second year, it would appear that the unbalanced ration supplied Lot B while young had permanently affected the live weight of the individuals.

### Number and Weight of Eggs Laid

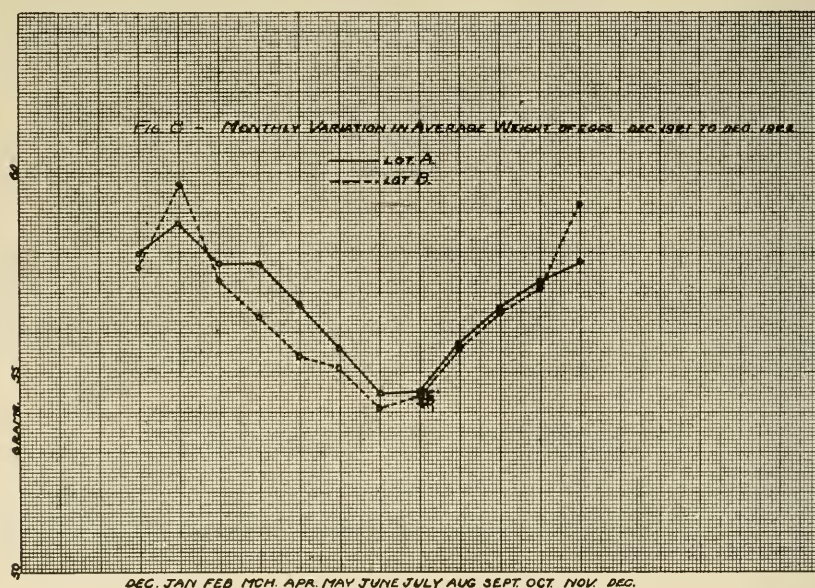
Table XIV gives the mean egg production and egg weight of the "average daughter" in the two lots for each month of the second year of the test and Fig. 8 shows graphically the mean egg weights for the period under consideration.

**TABLE XIV.—Mean Egg Production and Egg Weight of Lots A and B, December 1, 1921, to December 1, 1922**

|                 | LOT A                         |                                 | LOT B                         |                                 |
|-----------------|-------------------------------|---------------------------------|-------------------------------|---------------------------------|
|                 | Average No. Eggs Per Daughter | Average Egg Weight Per Daughter | Average No. Eggs Per Daughter | Average Egg Weight Per Daughter |
| December .....  | .70                           | 57.97                           | 1.83                          | 57.59                           |
| January .....   | .83                           | 58.69                           | .81                           | 59.78                           |
| February .....  | 5.51                          | 57.71                           | 5.14                          | 57.28                           |
| March .....     | 16.51                         | 57.70                           | 16.96                         | 56.37                           |
| April .....     | 19.72                         | 56.75                           | 19.97                         | 55.37                           |
| May .....       | 21.67                         | 55.48                           | 22.35                         | 55.10                           |
| June .....      | 21.27                         | 54.44                           | 20.75                         | 54.08                           |
| July .....      | 22.23                         | 54.57                           | 20.77                         | 54.44                           |
| August .....    | 18.92                         | 55.75                           | 19.30                         | 55.67                           |
| September ..... | 14.57                         | 56.61                           | 11.78                         | 56.55                           |
| October .....   | 7.43                          | 57.38                           | 6.69                          | 57.11                           |
| November .....  | 1.59                          | 57.70                           | 1.71                          | 60.24                           |

With both lots the heaviest egg production was during May, June, and July. During these months the eggs were lightest in weight and it would seem that the weight of eggs laid by mature fowls was roughly in inverse proportion to the number laid.

Tables XV and XVI give the number and weight of eggs laid by each fowl, the number and weight of eggs for each "average daughter", and the means for the two lots.



**Fig. 8.—Monthly Variation in Average Weight of Eggs.**

**TABLE XV.—Summary of Average Egg Production Per Daughter  
in Lot A, December 1, 1921, to December 1, 1922**

| No. of<br>Dam                                 | No. of<br>Daughter | No. Eggs<br>Laid | Total Weight<br>of Eggs in<br>Grams | Average<br>Number<br>of Eggs | Ave. Total<br>Weight of<br>Eggs in Grams |
|---|--------------------|------------------|-------------------------------------|------------------------------|--|
| Y9729   | 311                | 165              | 9851.30                             | 165                          | 9851.30                                  |
| 66  | 308                | 164              | 8796.54                             | 165.67                       | 9277.88                                  |
|   | 313                | 176              | 9988.79                             |                              |  |
|   | 322                | 157              | 9048.30                             |                              |  |
| 104   | 330                | 153              | 8560.68                             | 153                          | 8560.68                                  |
| 138   | 327                | 166              | 9500.03                             | 169                          | 9307.68                                  |
|   | 351                | 172              | 9115.33                             |                              |  |
| Y9731   | 356                | 158              | 7816.74                             | 158                          | 7816.74                                  |
| 45  | 333                | 98               | 5368.73                             | 98                           | 5368.73                                  |
| 12  | 301                | 178              | 9675.83                             | 155.50                       | 8695.42                                  |
|   | 309                | 133              | 7715.02                             |                              |  |
| 22  | 325                | 144              | 8261.02                             | 144                          | 8261.02                                  |
| 49  | 324                | 135              | 7452.65                             | 134                          | 7385.05                                  |
|   | 320                | 103              | 5400.82                             |                              |  |
|   | 342                | 164              | 9301.68                             |                              |  |
| 10  | 332                | 140              | 8337.60                             | 159.50                       | 9431.55                                  |
|   | 355                | 179              | 10525.51                            |                              |  |
| 28  | 336                | 134              | 6896.96                             | 121                          | 6534.80                                  |
|   | 331                | 108              | 6172.64                             |                              |  |
| 7   | 302                | 192              | 11158.91                            | 192                          | 11158.91                                 |
| 19  | 326                | 142              | 7984.29                             | 169.50                       | 9614.95                                  |
|   | 315                | 197              | 11245.62                            |                              |  |
| 37  | 347                | 133              | 7243.31                             | 133                          | 7243.31                                  |
| <b>Total .....</b>                            |                    | <b>3491</b>      | <b>195418.30</b>                    | <b>2117.17</b>               | <b>118598.02</b>                         |
| <b>Ave. Production per<br/>Daughter .....</b> |                    | <b>151.78</b>    | <b>55.98</b>                        | <b>151.22</b>                | <b>55.97</b>                             |

**TABLE XVI.—Summary of Average Egg Production Per Daughter  
in Lot B, December 1, 1921, to December 1, 1922**

| No. of<br>Dam                                 | No. of<br>Daughter | No. Eggs<br>Laid | Total Weight<br>of Eggs in<br>Grams | Average<br>Number<br>of Eggs | Ave. Total<br>Weight of<br>Eggs in Grams |
|---|--------------------|------------------|-------------------------------------|------------------------------|--|
| Y9729   | 314                | 133              | 7905.87                             | 133                          | 7905.87                                  |
| 66  | 338                | 134              | 6916.34                             | 134                          | 6916.34                                  |
| 104   | 303                | 155              | 8629.69                             | 155                          | 8629.69                                  |
| 138   | 341                | 177              | 9923.02                             | 157                          | 8712.09                                  |
|   | 337                | 137              | 7501.17                             |                              |  |
| Y9731   | 304                | 158              | 7728.34                             | 158                          | 7728.34                                  |
| 45  | 312                | 94               | 5409.07                             | 113                          | 6172.17                                  |
|   | 350                | 132              | 6935.27                             |                              |  |
| 12  | 305                | 132              | 7194.99                             | 162.25                       | 9345.27                                  |
|   | 316                | 180              | 10117.63                            |                              |  |
|   | 323                | 181              | 9977.57                             |                              |  |
|   | 306                | 156              | 10090.88                            |                              |  |
| 22  | 319                | 162              | 8774.26                             | 162                          | 8774.26                                  |
| 49  | 329                | 141              | 8583.23                             | 141                          | 8583.23                                  |
| 10  | 352                | 152              | 7960.14                             | 159                          | 8974.33                                  |
|   | 335                | 166              | 9988.53                             |                              |  |
| 28  | 354                | 156              | 8627.07                             | 156                          | 8627.07                                  |
| 7   | 348                | 135              | 7708.25                             | 135                          | 7708.25                                  |
| 19  | 334                | 146              | 7806.95                             | 158.50                       | 8958.61                                  |
|   | 345                | 171              | 10110.28                            |                              |  |
| 37  | 340                | 154              | 8470.64                             | 154                          | 8470.64                                  |
| <b>Total .....</b>                            |                    | <b>3152</b>      | <b>176359.19</b>                    | <b>2077.75</b>               | <b>115506.16</b>                         |
| <b>Ave. Production per<br/>Daughter .....</b> |                    | <b>150.09</b>    | <b>55.95</b>                        | <b>148.41</b>                | <b>55.59</b>                             |



**Comparative Egg Production.**—Based on the “average daughter” the egg production for Lot A was  $151.22 \pm 3.9$  eggs, and for Lot B  $148.41 \pm 2.4$  eggs, or a difference of  $2.81 \pm 4.5$  which is not significant. The difference in egg weight was small, but Fig. 8 shows that during the entire year the eggs laid by Lot B were somewhat smaller than those laid by Lot A, except in January and November when egg production was too low for reliable averages.

### RESULTS WITH LOTS C AND D

The fowls in Lots A and B were mated to Male 10, a son of Hen 19. Incubation was started July 3, 1921. Table XVIII shows that 389 eggs laid by 44 hens were incubated. Of these, 265 were fertile and 209 hatched. In 8 cases all the eggs laid by certain hens were fertile, and in 3 cases none. In 12 cases all the fertile eggs hatched, and in 4 instances all the eggs laid by certain hens were fertile and all hatched. These facts illustrate the wide variation in fertility and hatchability of eggs laid by females in the same flock and mated to the same male.

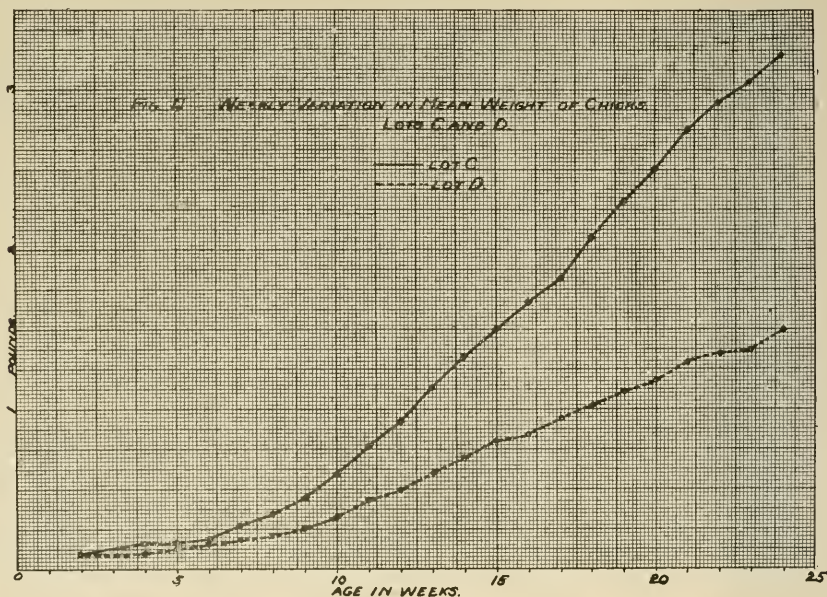


Fig. 9.—Weekly Variation in Mean Weight of Chicks, Lots C and D.

### Hatching the Eggs

The following table shows a wide variation in the fertility and hatchability of the eggs laid by the different hens.

TABLE XVII.—Record of Hatch

| Band No.<br>of Dam | Number of Eggs<br>Incubated | Number of<br>Fertile Eggs | Number of<br>Chicks |
|--------------------|-----------------------------|---------------------------|---------------------|
| 301                | 8                           | 3                         | 3                   |
| 302                | 5                           | 0                         | 0                   |
| 303                | 8                           | 5                         | 4                   |
| 304                | 5                           | 5                         | 5                   |
| 305                | 10                          | 1                         | 1                   |
| 306                | 10                          | 6                         | 3                   |
| 309                | 9                           | 3                         | 2                   |
| 310                | 11                          | 8                         | 8                   |
| 311                | 11                          | 9                         | 8                   |
| 312                | 3                           | 3                         | 3                   |
| 313                | 9                           | 8                         | 5                   |
| 314                | 9                           | 7                         | 5                   |
| 315                | 10                          | 9                         | 7                   |
| 316                | 12                          | 0                         | 0                   |
| 319                | 10                          | 8                         | 7                   |
| 320                | 9                           | 8                         | 7                   |
| 321                | 9                           | 5                         | 3                   |
| 322                | 10                          | 9                         | 9                   |
| 323                | 11                          | 0                         | 0                   |
| 324                | 10                          | 8                         | 6                   |
| 325                | 9                           | 6                         | 4                   |
| 327                | 8                           | 7                         | 6                   |
| 329                | 10                          | 5                         | 3                   |
| 330                | 8                           | 7                         | 7                   |
| 331                | 8                           | 6                         | 4                   |
| 332                | 8                           | 8                         | 5                   |
| 333                | 9                           | 5                         | 3                   |
| 334                | 10                          | 9                         | 5                   |
| 335                | 2                           | 2                         | 1                   |
| 336                | 9                           | 4                         | 4                   |
| 338                | 9                           | 7                         | 6                   |
| 339                | 10                          | 5                         | 3                   |
| 340                | 5                           | 5                         | 5                   |
| 342                | 9                           | 9                         | 9                   |
| 344                | 9                           | 5                         | 5                   |
| 346                | 10                          | 10                        | 9                   |
| 347                | 10                          | 8                         | 6                   |
| 348                | 10                          | 9                         | 7                   |
| 349                | 10                          | 8                         | 4                   |
| 351                | 9                           | 7                         | 5                   |
| 352                | 10                          | 9                         | 7                   |
| 354                | 11                          | 6                         | 6                   |
| 355                | 10                          | 6                         | 3                   |
| 356                | 7                           | 7                         | 6                   |

### Feeding the Chicks

Two lots of chicks, selected as in the earlier experiment, were brooded by a Newtown colony brooder, a partition separating the

two flocks. Table XVIII shows the kind and amount of feed consumed per week per hundred chicks and Table XIX shows the weight of the chicks per hundred from week to week and the number present in each lot at the beginning of each week. Fig. 9 shows graphically the variation in the mean weight of the chicks.

**TABLE XVIII.—Feed Consumed by Lots C and D**

| Week<br>of<br>Test | Feed Consumed by Lot C<br>Per 100 Chicks |              |                       |                       | Feed Consumed by Lot D<br>Per 100 Chicks |              |                       |                       |
|--------------------|--|--------------|-----------------------|-----------------------|--|--------------|-----------------------|-----------------------|
|                    | Lbs.<br>Cracked<br>Corn                  | Lbs.<br>Mash | Qts.<br>Whole<br>Milk | Lbs.<br>Meat<br>Scrap | Lbs.<br>Cracked<br>Corn                  | Lbs.<br>Mash | Qts.<br>Whole<br>Milk | Lbs.<br>Meat<br>Scrap |
| 1                  |  |              |                       |                       |  |              |                       |                       |
| 2                  | 2.4                                      | 4.2*         | 5.1                   |                       | 1.9                                      | 3.5*         | .9                    |                       |
| 3                  | 4.6                                      | 5.6          | 7.8                   |                       | 3.8                                      | 5.0          | 3.0                   |                       |
| 4                  | 3.7                                      | 10.6         | 8.5                   |                       | 2.4                                      | 9.4          | 1.1                   |                       |
| 5                  | 2.9                                      | 11.4         | 9.0                   |                       | 2.3                                      | 7.8          | 1.1                   | .2                    |
| 6                  | 5.2                                      | 10.7         | 9.5                   |                       | 4.6                                      | 7.4          | 1.3                   |                       |
| 7                  | 3.0                                      | 17.6         | 10.4                  |                       | 2.8                                      | 13.8         | 1.4                   |                       |
| 8                  | 4.5                                      | 22.7         | 15.9                  |                       | 3.4                                      | 14.4         | 2.0                   |                       |
| 9                  | 4.7                                      | 25.0         | 21.2                  |                       | 4.4                                      | 16.3         | 1.4                   |                       |
| 10                 | 11.8                                     | 26.9         | 21.5                  |                       | 5.0                                      | 20.4         | 1.5                   | .9                    |
| 11                 | 13.4                                     | 28.4         | 21.5                  |                       | 8.2                                      | 23.0         | 3.2                   | .6                    |
| 12                 | 6.6                                      | 50.7         | 21.5                  | .8                    | 6.0                                      | 33.9         | 3.2                   |                       |
| 13                 | 10.9                                     | 47.9         | 21.5                  | 1.5                   | 8.0                                      | 28.7         | 3.2                   |                       |
| 14                 | 14.0                                     | 40.6         | 21.5                  | 2.0                   | 10.2                                     | 21.0         | 3.2                   |                       |
| 15                 | 24.6                                     | 40.0         | 21.5                  | 3.5                   | 16.9                                     | 30.2         | 3.2                   |                       |
| 16                 | 32.3                                     | 40.8         | 21.5                  | 2.4                   | 30.6                                     | 31.4         | 3.2                   |                       |
| 17                 | 37.7                                     | 69.2**       | 21.5                  |                       | 24.2                                     | 35.5         | 3.2                   |                       |
| 18                 | 47.0                                     | 64.9**       | 21.5                  |                       | 26.6                                     | 30.2         | 3.2                   |                       |
| 19                 | 48.5                                     | 69.2**       | 21.5                  |                       | 38.4                                     | 28.7         | 3.2                   |                       |
| 20                 | 66.6                                     | 70.7**       | 21.5                  |                       | 29.0                                     | 41.1         | 3.2                   |                       |
| 21                 | 71.5                                     | 50.3**       | 21.5                  | 12.3***               | 34.2                                     | 43.9         | 3.2                   |                       |
| 22                 | 74.6                                     | 40.7**       | 21.5                  | 10.7***               | 35.5                                     | 43.6         | 3.2                   |                       |
| 23                 | 84.6                                     | 46.1**       | 21.5                  | 10.7***               | 40.3                                     | 37.6         | 3.2                   |                       |

\*Corn meal 2 parts, wheat bran 1 part.

\*\*Corn meal 2 parts, bran, middlings and meat scrap each 1 part.

\*\*\*Semi-solid buttermilk.

Both lots were fed liberally on grain, yet Lot C with the greater supply of milk, consumed much more cracked corn and mash than did Lot D.



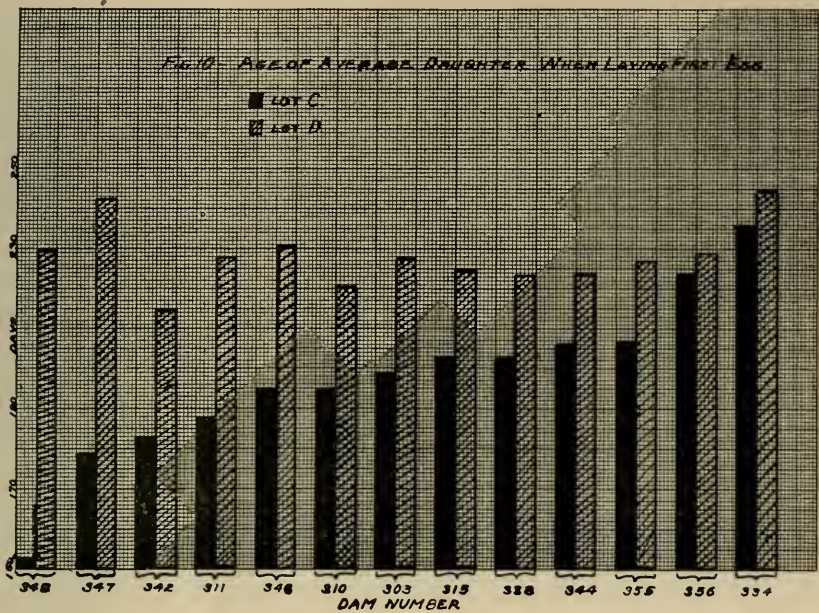


Fig. 10.—Age of Average Daughter When Laying First Egg.

TABLE XIX.—Number of Chicks in Lots C and D and Weight in Pounds Per Hundred Chicks From Week to Week

| Age in Weeks | Number of Chicks |       | Weight of Chicks per Hundred |        |
|--------------|------------------|-------|------------------------------|--------|
|              | Lot C            | Lot D | Lot C                        | Lot D  |
| 1            |                  |       |                              |        |
| 2            | 98               | 108   | 9.1                          | 9.3    |
| 3            | 90               | 98    | —                            | —      |
| 4            | 82               | 87    | 12.32                        | 10.92  |
| 5            | 78               | 81    | 17.05                        | 13.21  |
| 6            | 74               | 77    | 19.19                        | 15.32  |
| 7            | 67               | 74    | 27.91                        | 18.11  |
| 8            | 66               | 73    | 34.39                        | 21.92  |
| 9            | 66               | 71    | 45.61                        | 26.48  |
| 10           | 65               | 68    | 60.15                        | 33.82  |
| 11           | 65               | 63    | 76.92                        | 43.17  |
| 12           | 65               | 62    | 92.61                        | 50.32  |
| 13           | 65               | 62    | 113.85                       | 60.32  |
| 14           | 65               | 62    | 134.47                       | 70.32  |
| 15           | 65               | 62    | 150.77                       | 80.32  |
| 16           | 65               | 62    | 167.54                       | 86.45  |
| 17           | 65               | 62    | 182.46                       | 95.32  |
| 18           | 65               | 62    | 207.70                       | 103.22 |
| 19           | 65               | 62    | 230.31                       | 111.29 |
| 20           | 65               | 62    | 252.00                       | 118.55 |
| 21           | 65               | 62    | 276.91                       | 130.32 |
| 22           | 65               | 62    | 294.61                       | 135.48 |
| 23           | 65               | 62    | 307.69                       | 137.58 |
| 24           | 65               | 62    | 324.31                       | 150.41 |

**Grain Consumption and Weight of Chicks.**—Tables XVIII and XIX show that Lot C with the more liberal supply of milk not only consumed much more feed but grew much more rapidly than the others. At the close of the period the chicks in Lot C were more than twice as heavy as those in the other flock.

### Weights of Pullets

Tables XX and XXI give the weight of each fowl each month and the mean weight. During the last four months the birds in Lot D averaged about one-fourth pound lighter than those in Lot C.

**TABLE XX.—Weights of Fowls in Lot C in Pounds**

| No. of Dam | No. of Daughter | December 31 | February | March | April | May  | June | July | August | September | October | November | December |
|------------|-----------------|-------------|----------|-------|-------|------|------|------|--------|-----------|---------|----------|----------|
| 355        | 403             | 2.9         | 3.4      | 3.5   | 3.5   | 3.1  | 3.1  | 3.1  | 3.6    | 3.4       | 3.5     | 2.9      | 2.9      |
| 310        | 411             | 3.0         | 3.8      | 3.8   | 3.6   | 3.4  | 3.3  | 3.4  | 3.2    | 3.8       | 4.1     | 4.9      | 4.5      |
| 356        | 434             | 2.2         | 2.7      | 3.3   | 3.2   | 3.3  | 3.3  | 3.3  | 3.4    | 3.6       | 3.5     | 3.6      | 3.0      |
|            | 428             | 2.7         | 3.7      | 3.7   | 3.7   | 3.2  | 3.4  | 3.4  | 3.6    | 3.8       | 3.4     | 3.3      | 3.7      |
| 311        | 401             | 2.8         | 3.3      | 3.4   | 3.0   | 2.9  | 2.7  | 3.1  | 3.4    | 3.4       | 3.3     | 3.0      | 3.2      |
|            | 402             | 3.1         | 2.7      | 3.9   | 4.0   | 3.7  | 3.6  | 4.0  | 4.1    | 4.1       | 3.2     | 3.4      | 3.8      |
|            | 404             | 3.2         | 3.4      | 4.4   | 4.4   | 4.0  | 3.9  | 3.4  | 4.2    | 4.5       | 4.4     | 3.8      | 4.1      |
| 348        | 424             | 3.4         | 3.5      | 3.7   | 3.7   | 3.2  | 2.8  | 3.2  | 3.6    | 3.7       | 4.0     | 4.0      | 4.0      |
| 303        | 435             | 2.6         | 3.4      | 3.4   | 3.3   | 3.6  | 3.2  | 3.3  | 3.4    | 3.5       | 3.4     | 3.8      | 3.6      |
| 344        | 406             | 2.7         | 3.1      | 3.4   | 2.7   | 3.1  | 3.0  | 2.7  | 3.3    | 3.2       | 3.3     | 3.0      | 3.2      |
|            | 420             | 2.7         | 3.4      | 3.7   | 3.7   | 3.6  | 3.6  | 3.5  | 3.7    | 3.9       | 3.4     | 3.3      | 3.6      |
| 347        | 415             | 2.9         | 3.2      | 3.5   | 3.3   | 3.1  | 2.9  | 3.0  | 3.1    | 3.4       | 2.7     | 3.2      | 3.3      |
| 346        | 433             | 3.2         | 3.6      | 3.3   | 3.3   | 3.2  | 2.9  | 3.1  | 3.5    | 3.5       | 3.6     | 3.8      | 3.0      |
|            | 407             | 2.9         | 3.8      | 4.0   | 3.7   | 3.5  | 3.3  | 3.5  | 3.8    | 4.1       | 3.8     | 3.4      | 3.9      |
| 342        | 409             | 3.0         | 3.2      | 3.1   | 3.1   | 3.1  | 2.8  | 2.6  | 3.0    | 3.3       | 3.5     | 2.9      | 3.2      |
|            | 421             | 2.7         | 3.1      | 3.3   | 3.4   | 3.1  | 3.0  | 2.8  | 3.1    | 3.6       | 3.8     | 3.1      | 3.5      |
|            | 430             | 2.3         | 2.8      | 2.9   | 2.9   | 2.6  | 3.0  | 2.6  |        |           |         |          |          |
|            | 432             | 3.2         | 4.3      | 4.1   | 3.8   | 3.5  | 3.6  | 3.7  | 4.2    | 4.3       | 4.0     | 4.0      | 5.0      |
| 315        | 431             | 2.3         | 2.8      | 3.3   | 3.1   | 3.0  | 3.0  | 3.0  | 3.2    | 3.2       | 3.4     | 3.1      | 3.5      |
| 334        | 422             | 2.2         | 2.5      | 3.2   | 3.1   | 3.0  | 3.1  | 2.7  | 3.2    | 3.1       | 2.8     | 3.1      | 3.2      |
| 338        | 412             | 2.4         | 3.2      | 3.5   | 3.8   | 3.3  | 3.2  |      |        |           |         |          |          |
|            | 419             | 2.8         | 3.3      | 3.7   | 3.5   | 3.4  | 3.0  | 2.9  | 3.4    | 3.7       | 3.4     | 3.6      | 3.7      |
| Average    |                 | 2.76        | 3.27     | 3.50  | 3.43  | 3.26 | 3.13 | 3.14 | 3.44   | 3.58      | 3.48    | 3.50     | 3.58     |

TABLE XXI.—Weights of Fowls in Lot D in Pounds

| No. of Dam       | No. of Daughter | December 31 | February | March | April | May  | June | July | August | September | October | November | December |
|------------------|-----------------|-------------|----------|-------|-------|------|------|------|--------|-----------|---------|----------|----------|
| 355              | 440             | 1.1         | 1.9      | 2.7   | 2.6   | 2.2  | 2.8  | 2.5  | 2.6    | 2.8       | 3.1     | 2.4      | 2.6      |
| 310              | 426             | 1.5         | 2.6      | 3.1   | 3.0   | 2.8  | 2.9  | 2.8  | 3.0    | 3.1       | 2.9     | 2.9      | 3.6      |
| 356              | 439             | 1.7         | 2.5      | 3.6   | 3.4   | 3.3  | 2.9  | 3.0  | 3.3    | 3.6       | 3.5     | 3.7      | 3.6      |
|                  | 441             | .8          | 1.7      | 2.0   | 2.7   | 2.2  | 2.4  | 2.4  | 2.6    | 2.7       | 2.7     | 3.0      | 2.3      |
| 311              | 427             | 1.2         | 2.3      | 3.1   | 3.2   | 3.0  | 2.5  | 3.3  | 3.4    | 3.7       | 3.8     | 3.9      | 3.3      |
|                  | 414             | 1.7         | 2.5      | 3.2   | 3.3   | 3.2  | 3.1  | 2.2  | 3.0    | 3.5       | 3.7     | 3.7      | 3.6      |
| 348              | 418             | 1.3         | 2.2      | 3.1   | 3.3   | 3.1  | 2.9  | 2.9  | 3.0    | 3.4       | 3.5     | 2.8      | 2.8      |
| 303              | 405             | 1.1         | 2.1      | 2.8   | 3.1   | 2.9  | 2.8  | 3.2  | 3.3    | 2.9       | 3.0     | 3.7      | 4.1      |
| 344              | 413             | 1.6         | 2.4      | 3.2   | 2.9   | 2.8  | 2.9  | 2.8  | 3.0    | 3.3       | 2.9     | 2.9      | 3.2      |
| 347              | 437             | 1.1         | 2.0      | 2.7   | 3.0   | 2.6  | 2.3  | 3.4  | 3.2    | 3.4       | 3.6     | 3.7      | 2.9      |
|                  | 443             | .7          | 1.0      | 1.4   | 2.2   | 1.8  | 2.2  | 2.2  | 2.1    | 2.3       | 2.9     | 3.0      | 2.5      |
| 346              | 410             | 2.1         | 3.1      | 3.6   | 3.7   | 3.4  | 3.0  | 3.6  | 3.6    | 3.9       | 3.9     | 3.2      | 3.5      |
|                  | 417             | 1.2         | 2.1      | 2.7   | 3.1   | 2.9  | 2.9  | 3.2  | 3.4    |           |         |          |          |
| 342              | 442             | 1.3         | 2.3      | 2.9   | 3.2   | 3.0  | 2.8  | 3.0  | 3.0    | 3.2       | 3.4     | 3.0      | 3.1      |
|                  | 408             | 2.0         | 2.9      | 3.1   | 2.9   | 2.5  | 2.6  | 2.9  | 3.3    | 3.5       | 3.0     | 3.2      | 3.6      |
|                  | 425             | 1.7         | 2.7      | 3.3   | 3.4   | 3.3  | 3.0  | 3.2  | 3.5    | 3.8       | 3.9     | 4.1      | 3.2      |
| 315              | 423             | 1.8         | 2.5      | 3.3   | 3.3   | 3.2  | 3.2  | 2.9  | 2.7    | 3.2       | 3.5     | 3.6      | 3.2      |
|                  | 436             | 1.2         | 2.1      | 2.7   | 3.1   | 2.4  | 2.9  | 2.7  | 2.7    | 3.2       | 3.3     | 3.2      | 3.4      |
| 334              | 416             | 1.0         | 1.9      | 2.3   | 2.8   | 3.1  | 3.3  | 3.3  | 3.5    | 3.9       | 4.3     | 3.3      | 3.3      |
| 338              | 438             | 2.2         | 3.0      | 3.1   | 3.2   | 3.1  | 2.6  | 2.9  | 3.3    | 3.5       | 3.8     | 3.1      | 3.7      |
|                  | 429             | 1.8         | 2.6      | 3.1   | 3.3   | 3.0  | 3.1  | 2.9  | 3.1    | 2.9       | 2.9     | 3.3      | 3.4      |
| Average Daughter |                 | 1.39        | 2.26     | 2.89  | 3.05  | 2.84 | 2.84 | 2.91 | 3.07   | 3.30      | 3.37    | 3.21     | 3.26     |

## Age When First Egg Was Laid

The first egg obtained was laid by Pullet 424 on December 25, and the two lots of fowls were placed together on December 31. Owing to lack of room these pullets were placed in the laying house with their dams A and B. This made the house somewhat overcrowded. On May 1, Lots C and D were transferred to another house, thus providing better accommodations. They were fed the same ration as their dams.

Table XXII gives the age of each pullet when she laid the first egg. The mean age for the "average daughter" of Lot C was  $197.8 \pm 3.7$  days and for Lot D was  $228.5 \pm 1.7$  days, or a difference of  $30.7 \pm 4.1$  days. It may be observed here that one probable reason why these birds were considerably older than their dams when they began to lay was because they were placed in the same laying house with their dams and did not have the best possible opportunity to develop. Figure 10 shows the effect of the rations as influencing the age of arriving at sexual maturity.

TABLE XXII.—Age at Which First Egg Was Laid by Lots C and D

| No. of<br>Dam | Lot C              |                                      | Lot D              |                                      |
|---------------|--------------------|--------------------------------------|--------------------|--------------------------------------|
|               | No. of<br>Daughter | Age in Days<br>First Egg<br>Was Laid | No. of<br>Daughter | Age in Days<br>First Egg<br>Was Laid |
| 353           | 403                | 207                                  | 440                | 227                                  |
| 310           | 411                | 195                                  | 426                | 221                                  |
| 356           | 434                | 249                                  | 439                | 219                                  |
|               | 428                | 199                                  | 441                | 240                                  |
| 311           | 401                | 177                                  | 427                | 227                                  |
|               | 402                | 180                                  | 414                | 230                                  |
|               | 404                | 207                                  |                    |                                      |
| 348           | 424                | 153                                  | 418                | 230                                  |
| 303           | 435                | 199                                  | 405                | 228                                  |
| 344           | 406                | 225                                  | 413                | 224                                  |
|               | 420                | 188                                  |                    |                                      |
| 347           | 415                | 179                                  | 437                | 228                                  |
|               |                    |                                      | 443                | 257                                  |
| 346           | 433                | 192                                  | 410                | 226                                  |
|               | 407                | 198                                  | 417                | 237                                  |
| 342           | 409                | 164                                  | 442                | 229                                  |
|               | 421                | 180                                  | 408                | 194                                  |
|               | 430                | 188                                  | 425                | 223                                  |
|               | 432                | 201                                  |                    |                                      |
| 315           | 431                | 203                                  | 423                | 218                                  |
|               |                    |                                      | 436                | 232                                  |
| 334           | 422                | 236                                  | 416                | 245                                  |
| 338           | 412                | 199                                  | 438                | 205                                  |
|               | 419                | 207                                  | 429                | 242                                  |

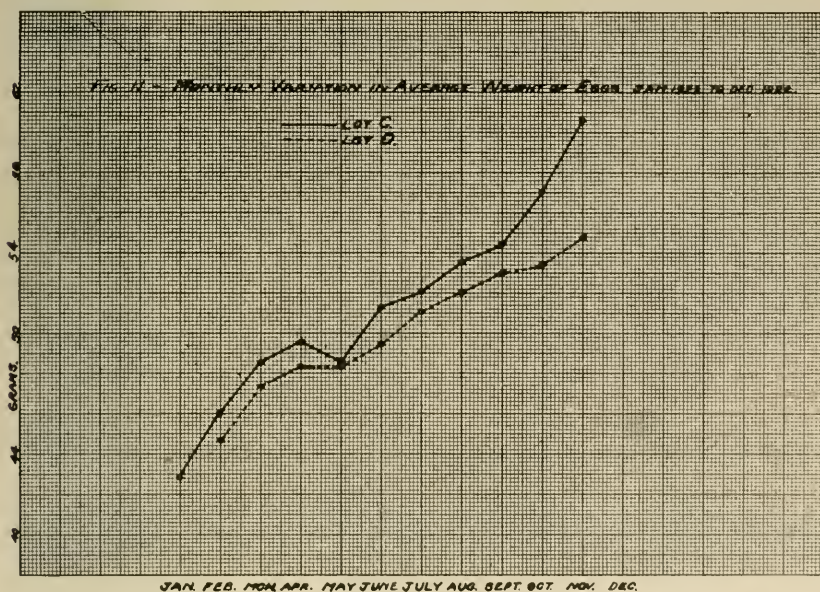
### Number and Weight of Eggs Laid

Table XXIII gives the egg production and egg weight of the "average daughter" in the two lots for each month. Tables XXIV and XXV give the total number of eggs produced and the total egg weight for each pullet; the number and egg weight for the "average daughters"; and the mean number of eggs and egg weight per "average daughter." Figure 11 shows graphically the variation in egg weight of the two lots and Figure 12 shows the mean monthly egg production.



**TABLE XXIII.—Mean Egg Production and Egg Weight of Lots C and D, January, 1922, to December, 1922**

|                 | Lot C                         |  | Lot D                         |  |
|-----------------|-------------------------------|--|-------------------------------|--|
|                 | Average No. Eggs Per Daughter | Average Egg Weight in Grams per Daughter | Average No. Eggs per Daughter | Average Egg Weight in Grams per Daughter |
| January .....   | 2.69                          | 42.88                                    | .00                           | .00                                      |
| February .....  | 5.63                          | 46.00                                    | .68                           | 44.73                                    |
| March .....     | 16.02                         | 48.55                                    | 12.28                         | 47.30                                    |
| April .....     | 19.01                         | 49.64                                    | 17.05                         | 48.39                                    |
| May .....       | 13.89                         | 48.61                                    | 12.73                         | 48.48                                    |
| June .....      | 19.65                         | 51.30                                    | 16.15                         | 49.54                                    |
| July .....      | 19.95                         | 52.16                                    | 11.74                         | 51.13                                    |
| August .....    | 19.91                         | 53.61                                    | 16.79                         | 52.02                                    |
| September ..... | 13.65                         | 54.53                                    | 14.25                         | 53.01                                    |
| October .....   | 5.77                          | 57.14                                    | 8.10                          | 53.44                                    |
| November .....  | 4.01                          | 60.80                                    | 3.86                          | 54.87                                    |



**Fig. 11.—Monthly Variation in Average Weight of Eggs, Lots C and D.**

The table shows that the maximum egg production of Lot C was in July, while the heaviest production of Lot D took place earlier in the summer. With both lots the average weight of the eggs increased with fair regularity from month to month.

**TABLE XXIV.—Summary of Average Egg Production Per Daughter in Lot C, December 1, 1921-1922**

| No. of Dam                           | No. of Daughter | No. Eggs Laid | Total Weight in Grams | Average No. Eggs | Ave. Total Wt. in Grams |
|--------------------------------------|-----------------|---------------|-----------------------|------------------|-------------------------|
| 355                                  | 403             | 123           | 6519.84               | 123              | 6519.84                 |
| 310                                  | 411             | 108           | 5653.91               | 108              | 5653.91                 |
| 356                                  | 434             | 147           | 7392.28               | 135.50           | 6955.35                 |
|                                      | 428             | 124           | 6518.43               |                  |                         |
| 311                                  | 401             | 148           | 7153.63               | 136.33           | 6915.46                 |
|                                      | 402             | 150           | 7912.45               |                  |                         |
|                                      | 404             | 111           | 5680.29               |                  |                         |
| 348                                  | 424             | 203           | 10516.79              | 203              | 10516.79                |
| 303                                  | 435             | 208           | 11014.84              | 208              | 11014.84                |
| 344                                  | 406             | 108           | 5353.91               | 130              | 6700.88                 |
|                                      | 420             | 152           | 8047.86               |                  |                         |
| 347                                  | 415             | 134           | 6126.77               | 134              | 6126.77                 |
| 346                                  | 433             | 180           | 9789.58               | 152.50           | 8053.48                 |
|                                      | 407             | 125           | 6317.39               |                  |                         |
| 342                                  | 409             | 156           | 8214.46               | 150.67           | 7709.77                 |
|                                      | 421             | 150           | 7215.44               |                  |                         |
|                                      | 432             | 146           | 7699.42               |                  |                         |
| 315                                  | 431             | 133           | 6864.68               | 133              | 6864.68                 |
| 334                                  | 422             | 82            | 4281.90               | 82               | 4281.90                 |
| 338                                  | 419             | 144           | 7204.47               | 144              | 7204.47                 |
| Total .....                          |                 | 2832          | 145478.34             | 1840.00          | 94518.14                |
| Average Production per Daughter..... |                 | 141.60        | 51.37                 | 141.54           | 51.37                   |

**TABLE XXV.—Summary of Average Egg Production Per Daughter in Lot D, December 1, 1921-1922**

| No. of Dam                           | No. of Daughter | No. Eggs Laid | Total Weight in Grams | Average No. Eggs | Ave. Total Wt. in Grams |
|--------------------------------------|-----------------|---------------|-----------------------|------------------|-------------------------|
| 355                                  | 440             | 112           | 5690.74               | 112              | 5690.74                 |
| 310                                  | 426             | 111           | 5358.97               | 111              | 5358.97                 |
| 356                                  | 439             | 186           | 9434.49               | 153              | 7534.27                 |
|                                      | 441             | 120           | 5634.05               |                  |                         |
| 311                                  | 427             | 168           | 8187.91               | 112.50           | 5427.31                 |
|                                      | 414             | 57            | 2666.71               |                  |                         |
| 348                                  | 418             | 143           | 6981.77               | 143              | 6981.77                 |
| 303                                  | 405             | 97            | 4920.26               | 97               | 4920.26                 |
| 344                                  | 413             | 107           | 5299.52               | 107              | 5299.52                 |
| 347                                  | 437             | 126           | 6409.39               | 93               | 4628.68                 |
|                                      | 443             | 60            | 2847.98               |                  |                         |
| 346                                  | 410             | 136           | 8005.22               | 136              | 8005.22                 |
| 342                                  | 442             | 120           | 6353.26               | 137.33           | 6843.33                 |
|                                      | 408             | 135           | 6300.72               |                  |                         |
|                                      | 425             | 157           | 7876.00               |                  |                         |
| 315                                  | 423             | 125           | 6223.91               | 141.50           | 7136.25                 |
|                                      | 436             | 158           | 8048.60               |                  |                         |
| 334                                  | 416             | 118           | 5964.36               | 118              | 5964.36                 |
| 338                                  | 438             | 140           | 7108.11               | 109.50           | 5612.33                 |
|                                      | 429             | 79            | 4116.56               |                  |                         |
| Total .....                          |                 | 2455          | 123428.53             | 1570.83          | 79403.01                |
| Average Production per Daughter..... |                 | 122.75        | 50.28                 | 120.83           | 50.55                   |

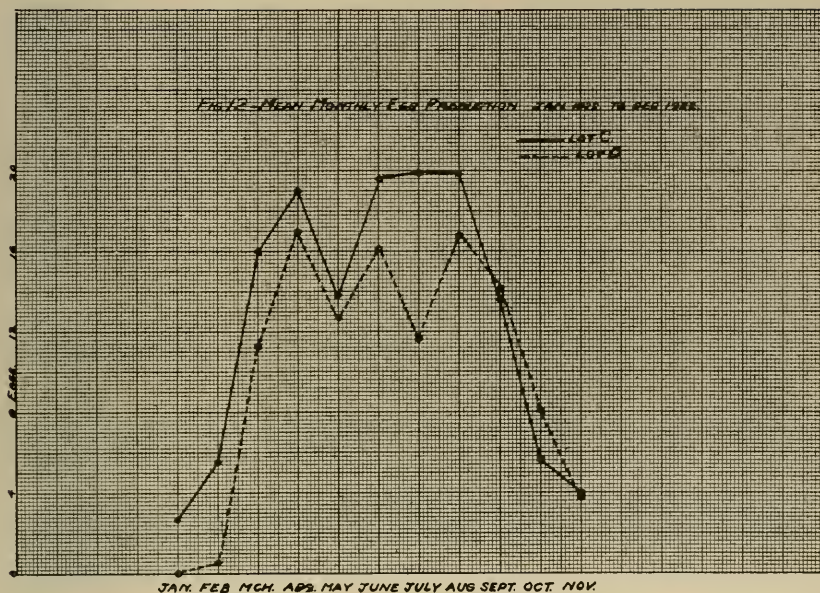


Fig. 12.—Mean Monthly Egg Production, Jan. 1922 to Dec. 1922.

In Lot C the number of eggs laid varied from 82 to 208, and in Lot D from 57 to 186. The "average daughter" in Lot C laid  $141.54 \pm 6.1$  eggs, while their full sisters in Lot D laid  $120.83 \pm 3.4$ , a difference of  $20.71 \pm 6.9$  eggs per bird in favor of the well-fed lot. For Lot C the egg weight averaged  $51.37 \pm .31$  grams and for Lot D  $50.55 \pm .38$  grams, the difference of  $.82 \pm .49$  grams probably not being significant. These results are in general agreement with those obtained with lots A and B for the first year.

### Effect Upon the Progeny of the Improper Nourishment of the Dam

In Lots C and D there were four classes of pullets: well-fed pullets from well-fed dams; well-fed pullets from poorly-fed dams; poorly-fed pullets from well-fed dams; and poorly-fed pullets from poorly-fed dams.

Although the data are too meagre to justify definite conclusions, yet it is interesting to observe the age of laying the first egg for these four classes of pullets. The following schedule shows the results.



| No. of<br>Daughters | Treatment of<br>Daughters | Treatment of<br>Dams | Age First<br>Egg Was Laid | Difference<br>in Days |
|---------------------|---------------------------|----------------------|---------------------------|-----------------------|
| 12                  | Well fed                  | Well fed             | 194.5 $\pm$ 4.0           |                       |
| 10                  | Well fed                  | Poorly fed           | 199.2 $\pm$ 4.4           | 4.7 $\pm$ 5.9         |
| 11                  | Poorly fed                | Well fed             | 224.3 $\pm$ 2.2           |                       |
| 9                   | Poorly fed                | Poorly fed           | 228.7 $\pm$ 2.4           | 4.4 $\pm$ 3.3         |

The difference in the age of the daughters when laying the first egg, due to the rations supplied their dams, was not great enough to be significant; and it seems probable that the number of individuals in each class was too small to show any definite change.

### Correlation Between Age of Hen When Laying the First Egg and Her Subsequent Egg Production

Is there any relation between precociousness in fowls and total egg production during the first year? If so, this would suggest a method for selecting the best layers.

It is evident that a pullet that begins to lay early in the fall has an advantage in respect to time over one that begins to lay later in the season, but it does not necessarily follow that the first to lay will lay the greater number of eggs during the pullet year.

The method used in calculating the correlation was that described by Dr. Frank M. Phillips in *Monthly Weather Review*, Vol. 50, No. 3. The age in days when laying the first egg and the number of eggs laid during the pullet year, or prior to December 1, constituted the balanced members. The results are shown below:

|                  |                    |
|------------------|--------------------|
| Lot A—First year | $r = -.24 \pm .13$ |
| Lot B—First year | $r = -.53 \pm .10$ |
| Lot C—First year | $r = -.53 \pm .11$ |
| Lot D—First year | $r = -.41 \pm .12$ |

All of the coefficients are negative, which is another way of saying that the birds that began to lay first, in general, laid more eggs during the pullet year than those that began to lay later.



## SUMMARY OF RESULTS

The results of this series of experiments seem to justify the following conclusions:

1.—A poorly-balanced ration fed to young chickens not only reduced the rate of gain in live weight but also reduced the mature weight of the females.

2.—A poorly-balanced ration fed to young chicks increased the age of the pullets before reaching sexual maturity or, in other words, before laying the first egg.

3.—A poorly-balanced ration fed to young chicks materially reduced the number of eggs laid by the pullets during the first laying season, and to a slight extent the number of eggs laid during the second year.

4.—A poorly-balanced ration fed to young chicks had little, if any, effect upon the average weight of eggs. More data should be obtained.





